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Review Article

Application Analysis of Fine-grained Drainage Asphalt Surface Layer in Sponge Urban Road

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Abstract: With the overall progress and development of the market economy, the construction of sponge city has received extensive attention. To further create an environment more suitable for people's lives, relevant departments should actively apply diversified materials and integrate material supervision mechanisms in the construction of sponge city roads, and construct a systematic road restraint mechanism and management system to ensure that the characteristics of the surface ecological environment can be fundamentally improved. This paper briefly analyzes the pavement structure design mechanism in combination with the engineering project. The application path of the fine-grained drainage asphalt surface layer in the sponge city road is explained from the mix ratio of the mixture and the construction process. It is for reference only.

Keywords: *fine-grained drainage asphalt surface layer; sponge city; construction; application*

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0 Introduction

The fine-grained drainage asphalt surface layer itself has porous and water-permeable characteristics, has high environmental protection efficiency, can effectively meet various demands such as sound absorption, anti-skid, and drainage noise reduction, and thus has received extensive attention. In the specific implementation process of the project, it is necessary to actively establish a sound and complete supervision mechanism so as to play the application value of the fine-grained drainage asphalt surface layer and lay the foundation for the overall quality optimization of the road.

1 The engineering case

This paper takes the construction project of a new district in a city as an example. The project section is a double-story double-drained semi-permeable roadway, green belt, and permeable walkway structure. At the initial stage of the construction project, it was taken as a component part of the sponge city to conduct a regional survey. To effectively adapt to the environmental changes of the construction project, it is necessary to effectively meet the requirements of water absorption, water storage, water seepage, and clean water during construction and achieve the goal of green environmental protection optimization of the overall project. The effect diagram is shown in Figure 1.

After determining the basic design plan, it is necessary to combine the road conditions and the surrounding environment to ensure the effective implementation of the plan to ensure that the construction process and construction plan of the fine-grained drainage asphalt surface layer in the sponge city road can meet the expectations. The construction period is expected to be 3 months to ensure economic benefits and environmental benefits to achieve a win-win situation.

2 Pavement design of fine-grained drainage asphalt surface layer in sponge city road

In the process of construction of sponge city roads, to meet the needs of environmental management projects, it is necessary to establish a sound and complete design plan, fully consolidate the construction engineering

needs and quality standards, and to some extent create a road design management and control mode suitable for the development of sponge cities[1]. It is worth mentioning that, in the process of establishing and operating a specific design mechanism, it is necessary to ensure the integrity of the structural design system, adhere to the fine management mechanism and detailed design principles, improve the comprehensive ability of specific analysis of specific problems, and effectively optimize the structural points. The management of the maintenance of the fine-grained drainage asphalt surface design parameters in the sponge city road lays the foundation for the subsequent improvement of the project supervision level[2]. In addition, the mixing ratio process should be supervised to ensure that the corresponding mix ratio parameter mode and operation requirements can be consistent with the sustainable construction supervision project, and the fine-grained drainage asphalt surface layer in the sponge city road can be truly utilized. Applying advantages and values, it creates a good platform for sponge city construction and urban standardized management.

Figure 1. Sponge city renderings

2.1 Pavement structure design

In the process of designing the road structure of the sponge city, the requirements of different materials for the corresponding hierarchical structure are met from the bottom up. The first is the modified emulsified asphalt advanced pre-protection layer, followed by a fine-grained drainage asphalt mixture, to ensure a thickness of 3.5 cm. Again, the coarse-grained drainage asphalt mixture has a thickness of 6.5 cm. It is equipped with a crack-resistant diversion layer and a porous drainage concrete layer. Finally, the rubber asphalt seal layer has a cement-stabilized macadam layer with a thickness of 30 cm, as shown in Figure 2.

It is worth mentioning that, in the whole pavement structure system, the fine-grained drainage asphalt surface layer has very important application value. It can not only effectively improve the strength parameters of the overall design but also effectively realize the functions of water damage resistance and anti-scattering and can play its drainage function value to a certain extent. To effectively improve the application level of fine-grained drainage asphalt surface layer, it is necessary to carry out centralized supervision on raw materials, mineral grading and mix ratio, so as to establish a complete analysis framework and operation plan and maintain the practical application value of the fine-grained drainage asphalt surface layer[3].

2.2 Mixing ratio design

In the fine-grained drainage asphalt surface mixing design system, it is necessary to carry out centralized analysis and comprehensive identification of specific parameters, effectively build a complete batching management project, and maintain the comprehensive value of the design process.

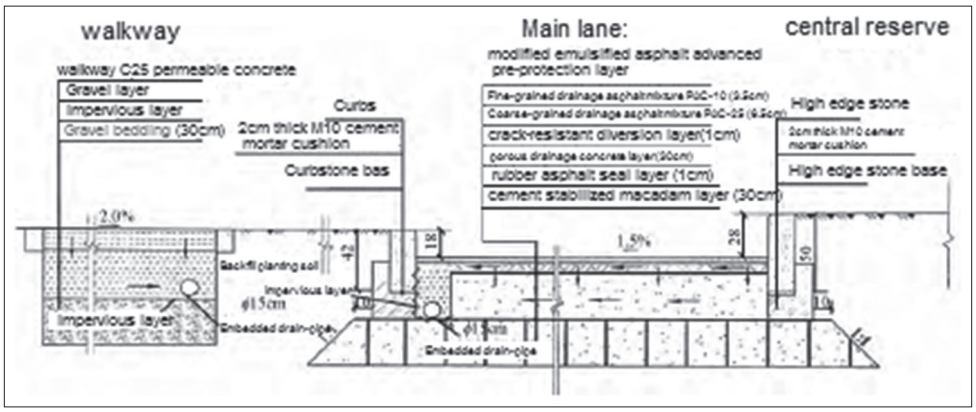

Figure 2. Pavement design structure

2.2.1 The choice of raw materials

The selection of asphalt and high-viscosity additives should be allocated according to the requirements of the actual construction project, and the analysis and determination of the modified asphalt composite modification parameters should be carried out to effectively improve the specific application efficiency. The fiber should also choose polyester fiber as much as possible, and the actual dosage is generally about 0.1% of the mass of the asphalt concrete. In addition, in the process of selecting the filler, the limestone ore powder is mainly used, and the fine aggregate is made of basalt mechanism sand of 0–2.36 mm and the coarse aggregate is controlled to be between 4.75 mm and 9.5 mm[4]. In summary, the corresponding materials should be selected in combination with the world-class construction status and application requirements to ensure that the overall level of the fine-grained drainage asphalt surface layer can meet the requirements.

2.2.2 Aggregate gradation and Mixing ratio

In the process of supervising the overall design and technical materials of fine-grained drainage asphalt surface, it is necessary to fully match the characteristics and process requirements of the project aggregate, and select different coarse and fine mineral materials to complete Marshall Compaction. This project selected B-class as the target mix ratio to optimize the volume index and improve the supervision of the road performance system. It should be pointed out that it is necessary to pay attention to the screening and synthetic grading of each aggregate. The specific parameters are as follows: (1) Oil stone is 5.3% than B grade; (2) polyester fiber B grade is 0.1%; (3) theoretical relative density B grade is 2.618; (4) gross volume relative density (vacuum) B grade is 1.991 and hair volume relative density (volume) B grade is 1.985; (5) uniform void ratio B grade 18.3%; (6) stability B grade 9.02 kN; and (7) flow value B grade 2.5/0.1 mm[5].

2.2.3 The best oil-stone ratio

In the process of analyzing the oil-stone ratio, should be combined with the application requirements of the actual construction project, effectively establish a complete supervision mechanism, and ensure that the application effect of the high-viscosity modified asphalt solution can meet the construction needs. Among them, SBS-modified asphalt and DHVA high viscosity additives are mainly involved, and polyacrylonitrile

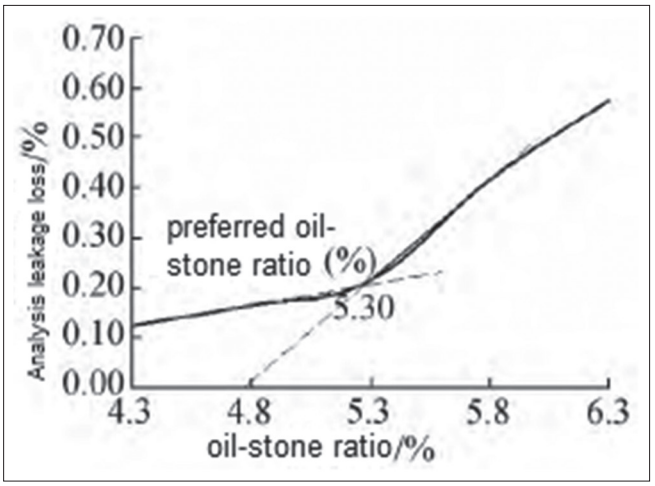

Figure 3. Oil-stone ratio analysis

fibers are added intensively[6]. At the same time, the relevant construction department should judge the parameter model by means of the absolute index of the leakage loss rate. Finally, the preferred oil-stone ratio is 5.3%, as shown in Figure 3.

Fourth, the performance analysis of the mixture, combined with the B-grade optimal oil-stone ratio to analyze the corresponding problems, can effectively verify and manage the mixture and comprehensively combine Marshall retention stability and freeze-thaw splitting strength ratio judgment to ensure that basic design requirements are met.

3 Construction technology of fine-grained drainage asphalt surface layer in sponge city road

To further promoting the comprehensive value of sponge urban pavement design management system, we should effectively implements the complete construction technology system, ensure that the advantages of the fine-grained drainage asphalt surface layer can fully display, ensure construction management environment and the control effect is more prominent, improve the construction management basic goal in a certain extent, to lay the solid foundation for sponge city comprehensively improving the quality of urban environment[7]. It is worth mentioning that the construction department should actively operate the complete construction process planning, starting from the mixing work and the construction supervision system of the test section, adhering to the fine construction principle, improving the integrity and safety of the construction process planning system. Implement the special post special person

mechanism during the construction process to improve the comprehensive level of sponge city construction management.

3.1 Stirring process

In the construction process of fine-grained drainage asphalt surface layer, the agitation process is more critical. Therefore, before the start of the mixing work, the relevant construction department should conduct a centralized analysis of the mixing ratio of the mixture and complete the trial mixing treatment of the mixing machine. The compounding ratio is verified by the standard grading so as to effectively ensure that the corresponding mixture parameter structure can meet the actual needs of the design.

3.2 Test section construction process

To meet the quality standards of sponge city pavement construction, relevant construction departments should actively establish and improve a complete supervision route within the specific construction technology system and must judge and comprehensively analyze the asphalt surface management mode to effectively improve the process supervision mode value.

3.2.1 Transportation process

Before the start of the construction paving work, the unloading management should be carried out on the site in combination with the actual transportation distance and the actual weather conditions. After the normal paving work is completed, it is necessary to ensure that three equipment are waiting for the unloading treatment, thus a certain degree. The basic effect of maintaining the operation of the paver is also laid the foundation for the overall progress of the transportation process supervision project. The most important thing is to establish a complete insulation measure to ensure that the temperature of the mixture delivered to the paving site is >175°C, and the corresponding maintenance mechanism is established by the person to measure the temperature of the factory and not meet the temperature requirements. The materials are disposed of with waste to improve the basic efficiency of supervision work[8].

3.2.2 The paving process

To ensure the overall application effect of the construction project, in the process of supervising the paving process of fine-grained drainage asphalt surface layer, it is also necessary to use a suitable type of paver for processing. The basic model of the VOGELE paver is S2100-2. In the actual application process, the pre-heating paving treatment should be carried out ½ h before the construction, and the corresponding flat iron processing can be completed to control the temperature >100°C. In the specific paving process, the specific vibrating work and the hammer compaction treatment project should be proofed to form a slow, continuous, and uniform uninterrupted operation plan. It is worth mentioning that the paving temperature of the drainage asphalt mixture should be controlled >170°C, to a certain extent maintain the comprehensive value of the application management project, and lay the foundation for the overall progress of the follow-up regulatory system[9].

3.2.3 The rolling process

The corresponding analytical framework should be established in combination with the quality standard of the fine-grained drainage asphalt surface layer, and the compaction treatment process should be perfected. The initial pressure should be >160°C, the recompression should be connected to the initial pressure work, and the recompression temperature should be >130°C. Finally, the final pressure temperature should be higher than 90°C, and the compaction treatment process can be performed by means of the test section. Moreover, the basic effect is judged[10]. The basic parameters are as follows: (1) Double-drum compactor, initial pressure is 1.5 km/h–2 km/h (4 times), recompression is 2 km/h –4 km/h (2 times), and final pressure is not applied. (2) The tire roller is not subjected to initial pressure, and the pressure is from 4 km/h to 5 km/h (4 times) without final pressure. (3) Vibratory roller, the initial pressure is 1.5 km/h–2 km/h (4 times static pressure), no recompression, and final pressure is 2.5 km/h–3 km/h (2 times static pressure).

3.2.4 Paving

After the test, it is necessary to supervise the forming quality and test section data to ensure that the paver is restrained by the running speed, and it is generally controlled between 1.5 m and 3 m/min[4].

3.3 Matters needing attention

To further improve the application effect of the fine-grained drainage asphalt surface layer in the sponge city road, relevant personnel should analyze the specific problems and establish a safe and complete supervision

mechanism to ensure that the comprehensive value of the application project can be improved according to the standardized process. It should be noted that, to ensure the application effect of the surface layer, the construction department should control the details in the sponge city road construction project, effectively improve the basic effect of the detail treatment, and maintain the value of fine-grained drainage asphalt surface layer in the sponge city road, and can achieve the development goals of the management process[11].

First, the drainage asphalt mixture should be paved to effectively enhance the continuity of the paving, to ensure the degree of uniformity and stability, to avoid the problem of segregation and the poor treatment of joints, and to effectively reduce the impact of manual repair.

Second, in the seam treatment process, the paver screed should be paid attention to ensure that the lock does not sink, the dwell time is controlled for >20 min, and the corresponding mix temperature is controlled <130°C. The most important thing is to pay attention to the seam problem according to the cold seam treatment process[12]. Especially, after the paving work is finished, the pavement compaction treatment should be completed with 3-m ruler, and the thickness and flatness should be effectively supervised; the seam processing efficiency can be improved to some. In addition, the joint construction project can be preheated and supervised before it starts, so as to maintain the comprehensive value of the reserved project.

Third, it is necessary to comprehensively control the artificial paving position. To ensure the application efficiency of the fine-grained drainage asphalt surface layer in the sponge city road, it is necessary to supervise the quality of the round head of the corner intersection. The process can only be done by manual paving, so it is necessary to concentrate on the rapid construction process, timely correct the scraper, and ensure the appearance of the material, effectively improving the flatness and quality level. The most fundamental thing is to supervise the flat vibration machine auxiliary treatment project and maintain the compaction control effect[13].

Fourth, it is necessary to protect the finished product and control the traffic. On the one hand, after the construction of the fine-grained drainage asphalt surface layer in the sponge city road, due to the large porosity of the permeable concrete, this will cause rust and soil contaminants before the rolling operation, which requires correlation. The personnel cleaned and controlled them in a centralized manner to ensure that a complete supervision mechanism could be established, and after the final pressure treatment process was finished, the color strips were covered and the railings were effectively set up to avoid the problem of people stepping on. On the other hand, to fundamentally improve the protection effect of the fine-grained drainage asphalt surface layer in the sponge city road and reduce the road surface pollution, it is necessary to close part of the road after the construction of the drainage asphalt surface layer in the test section. Effectively improve the overall construction level, and can spread the quality acceptance after natural cooling, to ensure that the temperature of the mixture can be controlled below 50°C which allow the passage of vehicles

4 The application effect of fine-grained drainage asphalt surface layer in sponge city road

After conducting a comprehensive quality analysis on the fine-grained drainage asphalt surface in the sponge city road, it is found that only by improving the application and management of relevant parameters such as raw materials, mineral grading and blending ratio, as well as improving the effect of multi-scheme selection, can the overall level of index supervision work be truly improved and construction tasks be effectively completed. After the construction of the fine-grained drainage asphalt surface layer in the sponge city road, the construction department experienced several heavy rain verifications, and the unit quality was measured and analyzed. The fine-grained drainage asphalt surface layer in the sponge city road the anti-sliding performance is better, and the problem of internal helium in the region can be solved to some extent, and the overall application effect is in line with expectations[14].

5 Conclusion

All in all, in the application management mechanism of fine-grained drainage asphalt surface in the sponge city road, the construction department should implement the refined management and control process, improve the construction parameter processing and analysis work level, and construct a more harmonious construction plan, combined with the environment. Requirements

for the development of sponge cities ensure that the fundamental effects of the construction framework system and construction plan meet expectations lay the foundation for the sustainable development of urban construction work and achieve a win-win situation for economic benefits and environmental benefits.

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