

# 高速公路水泥稳定碎石全厚式摊铺施工质量控制

白雪

(重庆交通大学土木学院,重庆 400074)

**摘要** 结合某高速公路水泥稳定碎石基层工程实践,研究分析了全厚式水泥稳定碎石基层的材料控制、配合比设计以及施工质量控制,为全厚式水泥稳定碎石基层大面积推广提供一定的参考指导。

**关键词** 全厚式  水泥稳定碎石基层  摊铺  施工质量控制

**中图法分类号** U414.1;  **文献标志码** A

A sort of roadbase construction technology for dense compaction by rolling in accordance with association and more than 25 cm thick of one-time cement stabilized macadam paving, then rolling equipment for 30 t or more, which is full depth of cement stabilized macadam paving. There has good stability, mechanical properties and cracking resistance in the whole base structure paving that with wide range of applications in recent years for the airports, expressways and common roadbases.

Beltway of southwest line in Guiyang is from Guixin Highway of Xiaobi dam in Huaxi district to Shawen sharp slope in Baiyun district where it joins the Guizun expressway and Guiyang beltway of northeast in sharp slope terminal. The total length is 55.1 km with standard for four lanes of two-way constructions and design speed for 100 km full depth construction technology is adopted in the construction of the base beltway in Guiyang so as to improve the whole base performance.

## 1 Marterial preparation

### 1.1 Cement

As stabilizer aggregate, the quality of cement on

subgrade construction is essential. We should select the cement with long final setting time and low grade during construction. Do not use ferrocrete, early strength cement even have become damp and rotten. Cement of this project is adopted a brand of Wujiang for PC32.5 from Guizhou firm. Fresh cement which have been set aside cannot be used until seven days for making stable materials have plenty of time for mixing, transporting, paving, rolling and ensuring sufficient strength.

### 1.2 Aggregate

To require maximum size of stone is less than 31.5 mm and crushing value is not more than 30%. For coarse aggregate is lager than 5 mm with grading key control, for fine aggregate is less than 5 mm with grading key control and sand equivalent is not lower than 60%. The percentage passing of 0.075 mm not exceeding 6% to reduce the risk of late fracture. Limestones in the Yunshan yard of Guiyang with the base. Technical performance indicators in table 1.

Table 1 The result of aggregate tests				
specification/mm	Test items	Technica-index	Measured-value	testway
5 ~ 30	Relative bulk density	—	2.723	T 0304—2005
	Crushing value, %	≤30	20.3	T 0316—2005

1.3 Water

General drinking water can be used. To make use of well water and not use muddy and sewage water. We should test the water in case of suspicious by relevant departments.

2 Design of mix proportion

2.1 Design method

In the base of cement stabilized macadam dosage which is too low to meet the strength or stiffness and too high to temperature shrinkage, large deformation and cracks. In the mix design, cement stabilized macadam can be used vibration method so as to meet requirement of strength and siffness in the case of dosage reduction, but also improve the crack resistance.

2.2 Make sure the indoor mix

Taken to test the site with cement by 3.5% , 4.0% , 4.5% three dosages and to use vibration to certain mixture in each group of optimum moisture content and maximum dry density. See in table 2.

Table 2 The result of vibrate compaction for mixture			
Cement doses/%	3.5	4.0	4.5
Optimum moisture content/%	3.5	3.6	3.8
Maximum dry density/( g · cm <sup>-3</sup> )	2.441	2.446	2.451

Determine the optimum moisture content and maximum dry density with vibrate compaction test as the base to shape specimen with vibration. The degree of specimen compaction are identified 98% of maximum dry density. (95% relative humidity, 25℃ ± 2℃ in curing room). After six days conservation and one day immersion, we can obtain the results of unconfined compression under the standard conditions. Table 3 next.

Probability of 95% intensity is compared to design of  $R_d$  intensity. 4.0% and 4.5% of cement doses for demand to vibration specimen of  $R_{c0.95}$  which is lager than  $R_d$  (4.0 MPa for base). Take all factors into con-

sideration with the project economics and onsite mixing conditions.

Table 3 Unconfined compression of cement macadam for 7 days			
Cement doses/%	3.5	4.0	4.5
The average of unconfined compression for 7 days/MPa	5.3	7.7	8.6
Deviation fator $C_v$ /%	11.0	8.2	7.5
95% probability of intensity $R_{c0.95}$ /MPa	3.9	5.2	6.7

2.3 Determine the constructing rate

Water content better than the the optimum moisture for 0.5 % ~ 1.0 % which depends on the effect of temperature, wind speed and sunshine at the site. Cement: aggregate = 4.5: 100 is the mix ratio of adjustment. The optimum moisture content of admixture for 5.3% , maximum dry density of 2.446 g/cm<sup>3</sup> and site compaction control by 98% .

3 Construction quality control [2-5]

3.1 Mix the mixture

Aggregate curve that came up with mixture by the weight ratio of cement, aggregate and water were fixed until production, then there was a screening test for checking it whether meet the grading requirements or not. There have sampling work on water content of mixture and cement doses once every 1 to 2 hours at the same time. According to temperature changes we could adjust the water content timely in the morning, noon and evening.

3.2 Mixture transport

Only the self-dumping trucks over 18 t will be operated in transit. The trucks must be moved back and forth in the loading to avoid pyramid formation isolating the aggregate, stopping in transit without reason and trying to move comfort.

3.3 Paving mixture

More than 25 cm thick of one-time full depth ce-

ment stabilized macadam paving can be used the DT1600 anti-segregation paver which product in Shanxi zhongda that go wrong with mixture segregation more easily. The self-dumping trucks offer paver mixture to keep from rolling down and increasing segregation should unload rapidly. There shall have specialized persons responsible for elimination of coarse aggregate segregation during the paving, especially the aggregate nests with partial formation that must be filled with new mixture in time. Get ready to control the paving speed within (1.5 ~ 2.5) m/min, width and cross slope.

3.4 Rolling of mixture

To meet the design standard, compacted density of full depth base of cement stabilized macadam have to adopt the rolling equipment of lager power for the basic section in this project with a DT1600 – 32 t, 22 t import and 18 t single drum vibrating roller in Shanxi zhongda and a 30 t rubber tire roller.

At the beginning of controlling the rolling speed 1.5 km/h ~ 1.7 km/h for 2 times and then getting to 2.0 km/h ~ 2.5 km/h. Rolling at a time should be overlapped 1/3 to 1/2 rounds with the last. It can be used robber tire roller to syrup purifying and face closure when it get to the standard for paving compaction. Not only the surface and sections after compaction required smooth, but also the cross slopes are up to the design. Compact the load after renovating timely in case of “spring, loose, peel” during the compaction with short rolling time so as to the structure of cement stabilized macadam which can be destroyed and reduce the strength of loadbase.

4 Field test

To test the roughness, compaction, grading, cement dose, moisture content and strength for loadbase with the pile no. K23 + 667 ~ K24 + 100 for testing the base paving effect of 36 cm full depth cement stabilized

macadam. The result of tests was shown in table 4.

Table 4 Detection value of basic cement stabilized macadam

Items	The average detection	Technical requirements	Remarks
Compaction/%	98.6	≥98	/
Flatness/mm	5	8	/
Cement dose/%	3.9	4.0 ± 0.5	/
Grading	Grading range	Speciification range	/
Strenth/MPa	5.4	≥4.0	Immersion compressive strength of 7 days
Water content/%	/	± 2	/

Make use of the technique of control over construction quality which must be put forward in the project on the table 4. Technical indicator of full depth cement stabilized macadam base at 36cm for paving can meet the requirement of criterion and ensure the construction quality.

5 Conclusion

Full depth cement stabilized macadam base of beltway of southwest line in Guiyang ensure fairness and meet the requirement of pavement construction specifications with technical indicator that through controlling the step in material, design process and control over construction quality, reflecting the feasibility of construction quality technical process in this sections and being of wide value.

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# Analysis of Hybrid City Bus Running Adaptability in Plateau

SHEN Jiang-wei, RUAN Hui-ping, HE Jing, LI Hong

( Kunming University of Science and Technology, College of Traffic, Kunming 650224, P. R. China)

[Abstract] Based on the information management and monitoring system for the new energy vehicles demonstration running in Kunming, the hybrid buses and pure diesel buses running data were collected on the same bus line in plateau, compared fuel economy and failure of tested buses. The results show that the hybrid bus could save fuel obviously, that the average fuel consumption of 100 km reduces about 11.34% compared with pure diesel buses; the hybrid bus fuel economy is fluctuant, plateau environment and the habits of the drivers have significant effects on the fuel economy of hybrid bus. The failure rate of hybrid buses is significantly higher than pure diesel buses, and will increase with the running time growth.

[Key words] plateau      hybrid      fuel economy      failure

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# Construction Quality Control of the Full Depth Cement Stabilized Macadam

BAI Xue

( Chongqing Jiaotong University, Chongqing 400074, P. R. China)

[Abstract] The engineering practice of cement stabilized macadam based course of Guiyang southwest beltway is based on, discussed material control, mixture design and construction quality control of the full depth cement stabilized macadam based course. The necessary information to promote and learn for its generalize are provided.

[Key words] full depth      cement stabilized macadam base course      paving      construction quality control