

Analysis of Factors Affecting the Compressive Strength of Cement Stabilized Crushed Stone Materials

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Abstract: The compressive strength of the cement stabilized macadam is one of the important parameters of design and performance evaluation. But in the present study of mud stabilized macadam pavement structure reasonable design and behavior analysis of strength did not realize the importance of parameter selection is relatively insufficient. This study is based on the compressive strength of cement stabilized macadam parameter selection as the research direction, by collecting both the compressive strength of the cement stable macadam mixture, and modulus of the test data, Establishing database of strength , obtain various parameters represent value under different reliability, analysis of curing age, different influence factors such as cement dosage, and the compressive strength of the cement stable macadam mixture, Using the mathematical regression method, the establishment of different curing age, under the condition of cement dosage prediction equation, verified the established modulus of logarithm model has higher fitting precision, can provide for pavement structure design and performance forecast value basis.

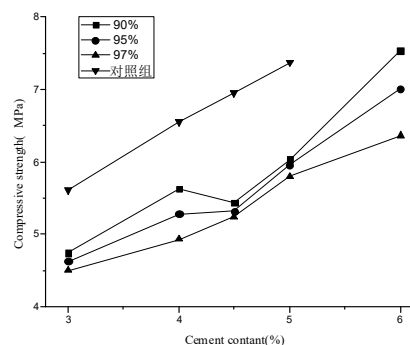
1 INTRODUCTION

Cement stabilized macadam base material is paving the main bearing layer under the surface in the road surface and at the grass-roots level, take on surface transfer driving vertical load, and the load evenly dispersed in the roadbed. Affected by various factors such as construction technology and construction environment, the influence of the easy occurrence crack in cement stabilized base construction process, segregation, partial loose, strength, smoothness and other defects, which affect the quality of pavement, caused the road all kinds of diseases.

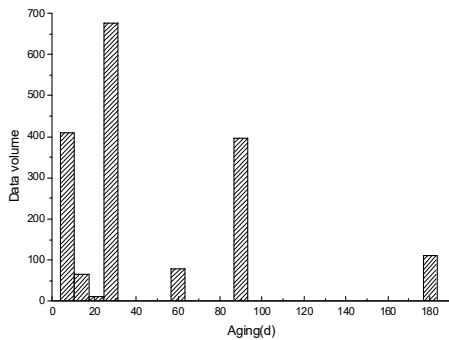
In this study, the correlation between factors such as cement dosage, curing age and compressive strength was studied in this study. By comparing the compressive strength under different conditions, the strength prediction model was studied, and the analysis intensity was influenced by different factors. The values of compressive strength data are selected, which can be used as reference for experiments .

2 DATA ANALYSIS OF COMPRESSIVE STRENGTH TEXT

The compressive strength of cement stabilized gravel is affected by many factors, and the data distribution is analyzed from different influencing factors.



(a) Curing age influence diagram



(b) Cement dosage influence diagram

Fig.1 Cement stabilized gravel unconfined aging

It can be seen from figure1 (a) that, from the perspective of the curing age, the compressive strength of the cement stabilized gravel is at 7d, the data volume is 400 and 28 days, the data volume is over 600, and the time of 90 days is 400. According to the figure1 (b) from the cement dosage, the data of the cement stabilized gravel is mainly concentrated in 3%, 3.5%, 4%, 4.5%, and 5% of the total amount, which is over 80%.

3 THE DATA OF COMPRESSIVE STRENGTH IS DETERMINED BY THE VALUE

3.1 Degree of Reliability

Influenced by many factors, the pavement material parameters have a large variability, which has a great influence on the performance and service life of the road surface. At present, the pavement structure design of the reliability of the generally accepted the range of 80% to 99%, 90%, 95% and 97% this article selects three values of high reliability, in order to get high credible degree of intensity values.

3.2 Selection of Representative Values

Reliability design method is actually a probability analysis method, based on the curve of the high level of literature, comparing the reliability condition, and the trend of cement dose intensity values along with age more in line with the general rules, thus choose a reliability represent value as a representative of the final value. To static pressure molding condition, the skeleton dense type stable macadam mixture, cement

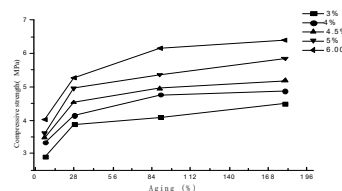
dosage 4.5% when change with ages and ages for 90 d change with cement dosage of compressive strength, for example, under the assurance rate 97%, the compressive strength of the cement stable macadam mixture, along with the change of age trend is more in line with the general rules, namely with the increase of age, and in the early days (0 ~ 7 d) mixture strength is growing rapidly, medium term (7 ~ 28 d) increase trend becomes flat, the late (28 ~ 180 d) more gently. In the same way, the compressive strength of cement stabilized crushed stone under the guarantee rate also conforms to the general rule, that is, the relationship between strength and dose is roughly a linear relationship. Therefore, under the condition of static pressure forming, the compressive strength of the solid cement stabilized gravel mixture is selected as the final representative value with the value of 97% guarantee rate. If the representative value trend of the three guarantee rates is consistent with the general rule, the representative value of the 95% guarantee rate is selected as the final value.

4 THE INFLUENCE FACTORS OF UNCONFINED COMPRESSIVE STRENGTH

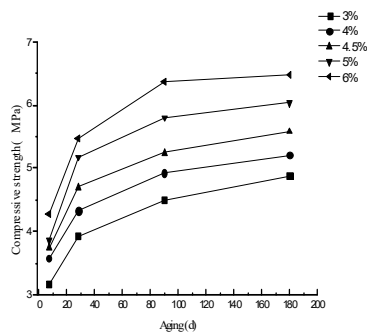
Select the compressive performance of cement stabilized macadam mixture degree higher curing ages, cement dosage, forming method and the aggregate gradation type four aspects, such as factors, through strength data contrast, analysis of the factors under the tendency of the compressive strength of the mixture.

4.1 Curing Age

In order to study the change of unconfined compressive strength with age in different cement doses the change curve of the value of compressive strength was plotted with the age.



(a) The static pressure molding GM mixture



(b) The static pressure molding XM mixture

Fig.2 Cement stabilized gravel unconfined compressive strength and the ages

The figure 2 shows that the cement stabilized gravel unconfined compressive strength along with the growth of the age, is nonlinear, according to the change trend can be divided into three stages: when age in 0 ~ 28 days, strength increase, the biggest can reach 25%; At the age of 28~90 days, the strength growth rate starts to decrease by about 2%; When the age is greater than 90 days, the strength growth curve flattens out and reaches the ultimate strength of the cement stabilized gravel.

According to the practical engineering experience, the cement macadam mixture when designing age 90 d has basically completed the intensity of the development, for comparison, this paper enumerates the 4% dosage of cement mixture unconfined compressive strength represents the values, are shown in table 1

Table1 unconfined compressive strength of the relationship with the age

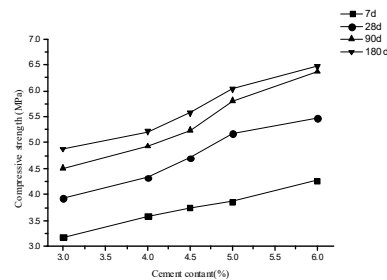
compressive strength/MPa	7d	28d	90d	180d
pressure shaping GM	3.56	4.34	4.92	5.24
pressure shaping XM	3.34	4.15	4.75	4.87
compressive strength/MPa	7d/180d	28d/180d	90d/180d	
pressure shaping GM	68%	83%	95%	
pressure shaping XM	68%	85%	98%	

The table 1 shows that when the 7 d of the cement stable macadam mixture, the unconfined compressive strength of about 60% of the nearly

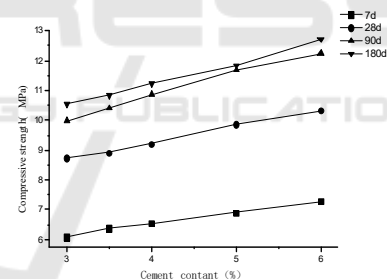
180d, 28d of the unconfined compressive strength has reached more than 80%, 90 d / 180 d unconfined compressive strength ratio has been close to 90%, and the general law of the experiment.

4.2 Cement Content

Cement dosage of the cement stabilized gravel unconfined compressive strength and one of the factors under the condition of different age, the cement stabilized gravel unconfined compressive strength with the change of cement dosage, as shown in figure 2.



(a) The static pressure molding GM mixture



(b) The static pressure molding XM mixture

Fig.3 Cement stabilized gravel unconfined compressive strength and cement dose relationship graph

Can be seen from figure 2, the same situation in other conditions, cement stable macadam mixture unconfined compressive strength increase with the increase of dosage of cement, and the cement dosage range, usually between intensity and dose of approximate linear growth. Increase the dosage of cement is helpful to improve the compressive strength, the reason is that the increase of cement dosage, can make the increase in the number of cement hydration reaction of cement, and thus enhanced the cohesive force of the mixture, thus

improve the compressive strength. Consistent with existing research results.

5. CONCLUSIONS

Based on the analysis of the influence factors of the unconfined compressive strength of cement stabilized gravel mixture, the following conclusions are drawn:

(1) Combining with analysis and outlier data screening, classification, sorting out the method of calculating the strength of the representative values under different reliability, and analyze the influence of different influence factors on the representative value degree, the analysis shows that the factors affecting the strength of cement stabilized macadam mixture are in line with the general law of experiment, the influence of selecting typical representative value.

(2) Analyze the influence of different influencing factors on the index of cement stabilized macadam mixture, and it can be concluded that the increase of cement stabilized gravel (before 28d) is large; At the same time, the strength increases with the increase of cement dosage. According to the specification, the representative value has certain accuracy and representativeness.

(3) Using different models to predict the strength of cement stabilized macadam mixture and the strength of the mixture and cement dosage and curing age the relationship between the change of the fitting, determine the has higher fitting precision of the cement stable macadam mixture strength prediction equation, has high reliability verification, for the strength of the cement stable macadam mixture parameter selection for reference.

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