

With the performance study of the Guss asphalt road

Jinqiang Zheng

College of Civil Engineering Chongqing Jiaotong University, Chongqing, China

Abstract

Based on the characteristics and advantages of the Guss Asphalt, the Guss Asphalt water stability, liquidity, rutting, low temperature crack resistance, fatigue durability experiment research. The experimental results show that the Guss Asphalt has good mobility and stability, can satisfy the use requirement road and bridge pavement.

Keywords: Guss Asphalt road, stability, and durability

1. Introduction

The Guss Asphalt (Guss Asphalt, GA for short) technology to produce to Germany, because of its high liquidity, casting self-compacting, without crushing, simply pouring leveling can complete the construction. Therefore, in the special road paving, building roof waterproof and dam engineering application is very broad. The Guss Asphalt has the characteristics of the "three highs", high ash content (20%~30%), high tar content (7%~10%), high mixing temperature (220~240 °C), the more free asphalt and fine aggregate content is filled between the coarse aggregate, forming suspended structure and determines the Guss Asphalt impervious after casting molding, strong integrity, fatigue crack resistance, with good deformation and durability characteristics such as strong. Therefore widely used in road pavement engineering of the bridge.

2. The Guss Asphalt performance advantages

The Guss Asphalt to suspended dense type structure, after high temperature mixing state has good liquidity, do not need to crush the viscoelastic material, the buffer sports under the state of stress reduction, won't produce damage, is not sensitive to impact and turbulence reaction, for special projects such as road pavement, and the performance advantages just satisfy the use requirement. Compared with those of paving asphalt concrete pouring type asphalt concrete has the following characteristics in the road pavement:

1. The void fraction is nearly zero: casting type air voids of asphalt concrete is almost close to zero, and is not connected between the internal pore, the pouring of the road pavement is impervious, not bibulous, for water containing Cl⁻ and constant humid climate impact response is not very sensitive, so won't appear the pavement diseases such as water damage, can be directly used as waterproof layer.
2. Good durability: as the Guss Asphalt of the void fraction approaching zero, even if there is a fine pore inside, is closed for disconnected, water can't into this kind of structure layer, greatly avoid the asphalt concrete embrittlement due to exposure to moisture in the rain and snow weather, aging, cause the decay of performance, and strong durability.
3. Does not show due to the rolling defect: the Guss Asphalt

self-compacting sex strong flows, without compaction can reach its ultimate strength. Therefore, can avoid many owing to lack of laying crushed or rolling temperature caused by segregation, aggregate segregation and other quality hidden trouble.

4. The fatigue cracking resistance and freeze resistance cracking performance is good, because the Guss Asphalt has higher dosage of asphalt, under the effect of repeated traffic and climate conditions, the pavement still has good resistance to low temperature cracking ability, can adapt to the repeated bending deformation, won't appear crack instability.
5. After deformation ability: the casting self-compacting paving asphalt concrete construction technology of casting type, pavement structure layer, besides has the ability of resistance to vertical deformation within the lateral horizontal direction, also should have strong ability of binding force and deformation, to ensure the effect of the pavement layer and the interface bonding and synchronization of deformation and structural layer.

In addition, in some special sections, such as small area repair roads, sidewalks, such as the central isolation belt on both sides of the edge can't adopt special regional overall mechanical compaction, in order to ensure the uniformity and smoothness of pavement structure layer, only using the Guss Asphalt can meet the specification requirements.

3. Road performance research

3.1 Water stability

Considering the Guss Asphalt construction characteristics and high temperature is easy to deformation of the shortcomings, in order to facilitate statistical analysis, find the experimental data regularity. By the rule of law as a density is big, small porosity of Marshall Specimen, Marshall Experiment under the condition of 20 °C, the water stability coefficient calculation, see formula:

$$(1) \quad K_w = R_2 / R_1$$

Type: Kw - water stability factor;

R₂- water forming specimen average compressive strength (MPa);

R₁ - forming specimen in air average compressive strength (MPa).

Table 1: Marshall Experiment result table

Specimen group number	Grading index / %	Asphalt content / %	porosity / %	Water stability coefficient
1	0.30	9.0	1.5	0.96
2	0.33	9.0	1.42	1.03
3	0.36	9.0	1.61	0.95
4	0.30	9.3	1.48	1.02
5	0.33	9.3	1.65	0.97
6	0.36	9.3	1.30	1.08

Can be concluded from table 1, the Guss Asphalt water stability coefficients is greater than or equal to 0.95, with good water stability, high content of asphalt, this is because the Guss Asphalt between space is filled with asphalt and mineral powder, mineral aggregate form suspended dense type structure, effectively blocking water seeping into the water damage of asphalt and aggregate interface.

3.2 Liquidity experiment

The Guss Asphalt in the construction process of construction workability to characterize with liquidity, generally take copper hammer into 50 mm the time required to determine the mixture of liquidity. According to the specification requirements, liquidity should not be more than 20 s, liquidity is too large, is not conducive to the construction is unfavorable to the high temperature stability. Also cannot too small, when concrete liquidity is too small, can produce aggregate segregation, could not reach the requirements of dense

Table 2: Liquidity experiment result table

Asphalt content /%	Mixing temperature /°C	liquidity /s
8.0	240	15
8.3	240	17
8.6	240	18
9.0	240	20

The table 2 shows that the casting type asphalt mixture liquid under the influence of asphalt content is very big, no matter what kind of grading, with the increase of asphalt content, mixture of liquidity and the approximate linear increase

3.3 The rutting test dynamic stability

As road pavement, must have good anti-rutting performance, using the Japanese graded lower limit and the new grading mixing good mixture preparation of rut, rut test, test the temperature of 60 °C, the test results as shown in table 3:

Table 3: The dynamic stability experiment result table

Asphalt content /%	Dynamic stability/ Times.mm-1)	
	average	technical requirements
8.0	728	≥350
8.3	485	
8.6	361	

From table 3, reduce the dosage of asphalt can greatly improve the dynamic stability of asphalt concrete pouring type, approximates to 8.0 when the dosage of asphalt, the more obvious dynamic stability and improve. This is because 8.0 is not free asphalt theoretically, the more close to 8.0, the initial suspended dense type gradually transformed into a skeleton dense type structure, which is provided by aggregate skeleton structure of high dynamic stability, asphalt dosage increased

by 0.1, dynamic stability by around 8%, asphalt content and dynamic stability performance for sex.

3.4 The low temperature crack resistance

Of the Guss Asphalt in low temperature bending test the specimen size is 300 mm x 100 mm x 50 mm, test temperature (-10±0.5)°C, loading rate is set to 50 mm/min, put in the specimen - 10 °C under the condition of heat preservation 3 h after bending experiments, the experimental results in the following table:

Table 4: Low temperature bending failure result table

Asphalt content /%	Bending tensile strength/MPa	Maximum bending strain /µε	Technical requirements
8.0	10.92	7.38×10 ⁻³	≥7.0×10 ⁻³
8.3	9.33	8.73×10 ⁻³	
8.6	10.26	9.16×10 ⁻³	

From table 4 that the Guss Asphalt with the increase of asphalt content, the flexural tensile strength as a whole have a tendency to reduce. But with the increase of dosage of asphalt, asphalt concrete of the maximum bending strain and significantly increase, strain has reached the requirements of technical specification (7000 mu epsilon) or higher. Shows that under the condition of low temperature environment, the Guss Asphalt to withstand larger bending deformation, not cracking destruction.

3.5 Fatigue durability test

Using IPC company produces the UTM in Australia-100 asphalt mixture experiment machine bending fatigue test, specimen size 50 mm ×65mm× 385mm; Test temperature 15 °C; Micro strain in 1000, using micro strain control load model to determine the specimen stiffness modulus reached 50% of the initial stiffness modulus load cycle loading times as its fatigue life. The test results as shown in table 5

Table 5: The fatigue life of asphalt concrete

Asphalt content /%	Initial modulus /MPa	Fatigue life/ten thousand times	Fatigue life of the average/ten thousand times
8.5	4884	18.4	22.5
	4651	28.9	
	4329	20.2	

Can be seen from table 5, the Guss Asphalt fatigue life of the average 225000 times. And indoor fatigue bending test, the beam tm specimen for state, only by unidirectional tension. In practical engineering, asphalt concrete pavement base bearing, for two-way flexural stress state, in the engineering application shows far greater than the fatigue life of the

fatigue life of indoor test is carried out. As a result, the Guss Asphalt has good resistance to fatigue durability.

4. Conclusion

Through the Guss Asphalt road and the advantages of analysis and research, can draw the following conclusion:

1. The Guss Asphalt due to large dosage of asphalt, the flow performance is good, can self-compacting, ensure the construction paving mixture workability and high temperature stability.
2. Of the Guss Asphalt's resistance to rutting test and fatigue durability test reflects it has the ability of pavement under load without damage
3. Because the deformation of the Guss Asphalt has good ability, able to absorb the road repair area, the stress and strain, for the small area of the hole, rutting, and other diseases is a kind of good pavement repair material

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