

Research on constructing the false pavement by emulsified asphalt materials

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Keywords: Emulsified asphalt, Pavement materials, Military application.

Abstract. Gauging the emulsified asphalt with gravel or machine sand, lime and paint, can formate emulsified asphalt slurry seal. In the military field, emulsified asphalt materials can be used to constructe the false asphalt pavement. This paper mainly analyses the choice and technical requirements of materials, discusses concrete construction steps.

Introduction

Including road pavement and bridge deck, among all kinds of constructed high grade pavements in our country, asphalt pavements take up 80-90%. Therefore, research on constructing the false pavement by emulsified asphalt materials, mainly includes researches on the choice, the technical requirements and composition of materials. Gauging the emulsified asphalt with gravel or machine sand, lime and paint, can formate emulsified asphalt slurry seal. The following is analysis of the choice and technical requirements of emulsified asphalt slurry seal materials.

The choice and technical requirements of materials in constructing the false pavement

As modern asphalt pavement is a composite mixed by coarse ore, fine ore, ore powder, emulsified asphalt and admixture in certain proportion and centigrade, the thickness of asphalt pavement is adopted 15-16 cm in many areas besides 18 cm as usual.

The design process of emulsified asphalt slurry seal mixture

Based on past experience, select a certain amount of asphalt, packing, additives and water, to conduct the following test, then according to the test ruslts, to determine the amount of materials.

Mixing test

Table 1 Mixing test results

Order number	Mass of dry ore material (g)	Amount of emulsion (%)	Amount of water (%)	Packing (%)	Additive (%)	Mixing time (s)	Test environment
1	100	14	10	1	0	115	Relative humidity 50%; Air temperature 26°C
2	100	14	10	1	0.1	131	
3	100	14	10	1	0.2	164	
4	100	14	10	1	0.3	188	
5	100	14	10	1	0.4	192	
6	100	14	10	1.5	0	106	
7	100	14	10	1.5	0.1	114	
8	100	14	10	1.5	0.2	140	
9	100	14	10	1.5	0.3	179	
10	100	14	10	1.5	0.4	186	

So we can see, the mixing test results of No.2, 3, 4, 5, 8, 9, 10 are good, and No.4 and 9 are more better.

Measruing mixture mixing time which is required more than 120s by mixing test. When mixing time doesn't meet the requirements, we can adjust the packing and additives to meet the requirement, then preliminary select the amount of emulsified asphalt, packing, additives and water (As Table 1).

Consistency test

To determine the amount range of water by consistency test. Normally, the consistency maintains at 20-30mm, the amount of water is more appropriate. Consistency test results (As Table 2).

Table 2 Consistency test results

Mass of dry ore material (g)	Amount of emulsion (%)	Amount of water (%)	Packing (%)	Additive (%)	Consistency (mm)	Test environment
400	14	5	1	0.3	20.1	Relative humidity 50%; Air temperature 26°C
400	14	10	1	0.3	25.4	
400	14	15	1	0.3	29.8	

As the results of Table 2, the consistency is appropriate, when the amount of water is 5-15% of dry ore material, and can be adjusted according to temperature and humidity in the process of construction.

Abrasion test by wet wheel

To determine the least amount of emulsified asphalt according to abrasion test by wet wheel (Table 3).

Table 3 Results of abrasion test by wet wheel

Order number	Mass of dry ore material (g)	Amount of emulsion (%)	Amount of water (%)	Packing (%)	Additive (%)	m_1 (g)	m_2 (g)	α (m ⁻²)	WTAT (g/m ²)
1	800	11	10	1	0.2	862.51	836.66	32.9	850.4
2	800	12	10	1	0.2	867.36	844.81	32.9	741.6
3	800	13	10	1	0.2	872.05	851.48	32.9	676.5
4	800	14	10	1	0.2	876.94	858.79	32.9	597.1
5	800	15	10	1	0.2	880.57	864.44	32.9	530.7
6	800	16	10	1	0.2	886.78	870.96	32.9	520.6

As the table:

$$WTAT = (m_1 - m_2) \times \alpha \quad (1)$$

WTAT—abrasion value of emulsified asphalt slurry seal mixture, g/m²;

m_1 —mass of test-piece before abrasion, g;

m_2 —mass of test-piece after abrasion, g;

α —coefficient, $\alpha = 1/A; m^{-2}$;

abrasion area (provide by instruction of the instrument), m^2 .

Rolling test by load wheel

To determine the most amount of emulsified asphalt according to rolling test by load wheel (Table 4).

Table 4 Results of rolling test by load wheel

Order number	Mass of dry ore material (g)	Amount of emulsion (%)	Amount of water (%)	Packing (%)	Additive (%)	G ₁ (g)	G ₂ (g)	A (m ²)	LWT (g/m ²)
1	500	11	10	1	0.2	534. 67	538. 79	0.00875	471.3
2	500	12	10	1	0.2	538. 42	542. 90	0.00875	511.8
3	500	13	10	1	0.2	541. 21	545. 99	0.00875	546.4
4	500	14	10	1	0.2	545. 02	549. 91	0.00875	557.2
5	500	15	10	1	0.2	547. 59	553. 10	0.00875	629.7
6	500	16	10	1	0. 2	550. 85	557. 07	0.00875	710. 9

As the table:

$$LWT = (m_2 - m_1) / A \quad (2)$$

LWT—mass of sand adhere to unit area of emulsified asphalt slurry seal mixture, g/m²;

m_1 —mass of sample after first round rolling, g;

m_2 —the total mass of sample and sand after second round of 1000 times rolling, g;

load area of sample (provide by instruction of the instrument), m^2 .

To determine the amount range of emulsified asphalt according to the histogram of WTAT and LWT (Fig. 1).

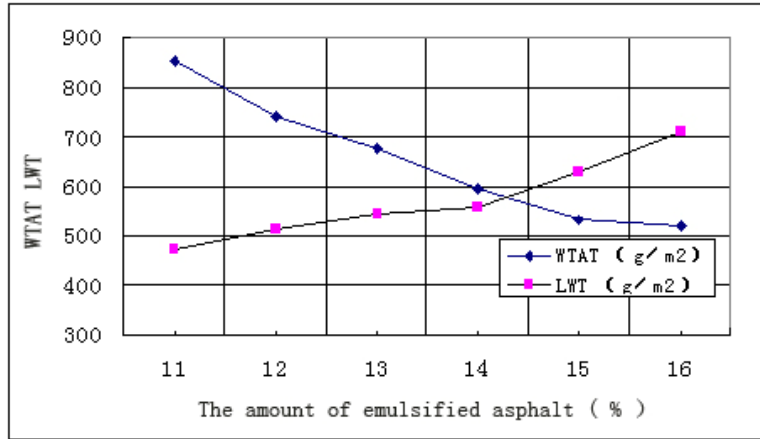


Fig. 1 Determine the amount range of emulsified asphalt

Adhesive test

To determine initial set of mixture according to adhesive test (As Table 5).

Table 5 Adhesive test results

Order number	Mass of dry ore material (g)	Amount of emulsified asphalt(%)	Packing (%)	Initial set time (min)	Adhesive at initial set time (N·m)
1	500	13	0.5	135	1.2
2	500	13	1.0	110	1.3
3	500	13	1.5	105	1.4

Remarks: The amount of water and additive is 10% and 0.2% of dry ore material respectively;
Test environment: Relative humidity 51%; Air temperature 27°C.

2.6 Composition and technical requirements of emulsified asphalt slurry seal mixture

According to the above test results, the composition of emulsified asphalt slurry seal mixture is: ore material to water to packing(silicate cement) to additive equals 100 to 13 to 10 to 1 to 0.2.

Steps of constructing the false pavement

As constructing the false pavement by emulsified asphalt material, the first step is to clean, smooth and compact the base level, the second step is to line on the basis of designed pavement scope, the third step is to mix the materials in proportion, the fourth step is to spread and compact the mixture according to the line, the last step is the late maintenance of pavement. Specific steps are as follows:

Cleaning, smoothing and compacting the base level

Clean the branches, leaves and any other arming by fan driven fire-extinguisher, improve the adhesive force of emulsified asphalt slurry seal mixture and the base level.

Marking and laying off the guide line

Mark and lay off the guide line on the basis of designed pavement scope, with the aim of straight and smooth-going of the road.

Mixing the emulsified asphalt slurry seal materials

According to the type of the false pavement which is to construct, mix the emulsified asphalt slurry seal materials in certain proportion, then stir the mixture evenly by machine or manpower.

Spreading and compacting the mixture

When spreading the emulsified asphalt slurry seal mixture to the base level, it is necessary to observe the condition of slurry, adjust the flow, keep properly consistency, in order to ensure the planeness, uniformity and non-running slurry.

The false pavement constructed by emulsified asphalt slurry seal materials, can be compacted by its own weight without rolling force. It can achieve better results by compacting of a wheeled vehicle or any other small-size rolling equipment.

Maintenance

Arrange a few people to maintain the false pavement occasionally, after it is constructed thoroughly, such as watering, cleaning the leaves and so on.

Conclusion

Constructing the false asphalt pavement by emulsified asphalt, is mainly used to simulate road pavement, helicopter landing field and false bridge deck, which are constructed by ore materials, packing, emulsified asphalt and water. The material mainly includes emulsified asphalt, limestone chips, silicate cement packing, additives, water and so on.

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