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# OVERVIEW OF THE TEST METHOD FOR ROAD PAVEMENT AT HIGH TEMPERATURES

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**Анотація**

*Виникнення колії дорожнього покриття матиме великий вплив на безпеку руху та організацію дорожнього руху. Розглянуто підготовку дослідних зразків, процедури випробувань та обробку даних високотемпературним тестом на утворення колій дорожнього покриття, а також наведенні інші методи оцінки високотемпературної стійкості асфальтобетонної суміші.*

**Ключові слова**: виникнення колії, високотемпературний тест, асфальтобетонної суміші.

**Abstract**

*The occurrence of a pavement track will have a major impact on traffic safety and traffic management. The preparation of prototypes, procedure of testing and data processing by high-temperature road pavement track formation, as well as other methods of evaluation of high-temperature stability of asphalt concrete mixture are considered.*

**Key words**: gauge, high-temperature test, asphalt mix.

## Introduction

Rutting is the accumulation of permanent deformation in the vertical direction caused by the repeated loading of the wheel track tracks on the asphalt pavement, in severe cases, the two sides usually bulge and deform. Its production is mainly due to the viscous flow of the asphalt mixture, the deformation of the subgrade and the base course, and includes a certain degree of compaction and material wear. It usually occurs in summer when the temperature is higher than 25°C to 30°C [1]. As a disease of asphalt pavement, rutting seriously affects the service level of asphalt pavement and the driving safety of vehicles. If the rut deformation can be predicted more accurately, it will be of great significance for rut prevention and effective maintenance[2].

High temperature rutting test is the deformation depth of the asphalt pavement under the repeated action of the wheel load. The calculated dynamic stability is used as an index to evaluate the permanent deformation resistance of the asphalt mixture[3]. High temperature rutting test is a kind of empirical test method. It is characterized by being able to intuitively understand the permanent deformation characteristics of the mixture, reflecting the influence of time and temperature changes on the permanent deformation of the asphalt mixture, and it is in good agreement with the actual road load and the effect of vehicle tire load[4].

## Experimental procedure

1 Test piece preparation(wheel-grind method). The wheel-grind method is used to make 300mm×300mm×50-100mm plate-like test pieces. (1) Take the preheated test mold out of the oven, and place a layer of paper in the test mold to facilitate demolding. Put all the asphalt mixture evenly into the test mold from the edge to the middle with a small spatula, the middle should be slightly higher than around. (2) Preheat the rolling wheel to 100°C in advance, place the test mold on the platform of the roller mill, lay a layer of paper on the surface of the test mold, gently lower the roller and adjust the total load to 9KN. (3) Start the roller mill and roll it according to the specifications until the Marshall standard compactness is 100% ± 1%. (4) Remove the test mold and demold it at least 12 hours later[5].

2 Equipment. Rut tester：test bed、test wheel（ Rubber solid tire, outside diameter 200mm, wheel width 50mm, rubber layer thickness 15mm, rubber hardness 84±4 at 20°C, 78±2 at 60°C, the test wheel travel distance is 230mm±10mm, rolling speed is 42 times /min±1 time /min, using crank link drive loading wheel round trip operation mode.) loading device （ The contact pressure at 60°C is 0·7MPa±0·05MPa, and the total load applied is about 780N); test piece deformation measuring device（ Displacement sensor, range 0,130mm, accuracy ±0.01mm); Temperature detection device（ Automatically detect and record the temperature of the surface of the test piece and the constant temperature room, with an accuracy of ± 0.5°C, and the temperature

is automatically and continuously recorded ）.

3 Experiment procedure. (1) Place the test piece together with the test mold in a thermostatic chamber that has reached the test temperature of 60°C±1°C, and keep it for not less than 5 hours and no more than 12 hours. A thermocouple thermometer is attached to the part of the test piece where the test wheel does not run (the thermocouple wire can also be buried in a corner of the test piece in advance when the test piece is made), and the temperature of the test piece is controlled to be stable at 60°C ± 0.5°C.(2) The test piece and the test mold are placed on the test bed of the rut tester. The test wheel is in the center of the test piece, and its walking direction must be the same as the rolling or driving direction of the test piece. Start the rut deformation automatic recorder, then start the test machine to make the test wheel travel back and forth for about 1 hour, or until the maximum deformation reaches 25mm. During the test, the recorder automatically records the deformation curve and the specimen temperature.

**Data processing**

Read the rut deformations $d_1$at 45min ($t_1$) and $d_2$ at 60min ($t_2$) from the deformation curve, accurate to 0.01mm. When the deformation is too large, the deformation has reached 25mm in less than 60min, the time when the deformation amount reaches 25 mm ($d_2$) is $t_2$, and the time before 15 minutes is $t_1$, the deformation amount at this time is $d_1$. The dynamic stability of the asphalt mixture test piece is calculated by the following formula:

$$Ds = +\frac{(t_2 - t_1) \times N}{d_2 - d_1} \times C_1 \times C_2$$

Where:$Ds$-Dynamic stability of asphalt mixture (time/mm); $d_1$-Deformation corresponding to time$t_1$(mm);$d_1$-Deformation corresponding to time $t_1$ (mm); $C_1$-Test machine type factor, the round-trip operation mode of the crank rod driving load wheel is 1.0; $C_2$-Test piece coefficient, the test piece prepared by the test room with a width of 300mm is 1.0; $N$-Test wheel round rolling speed, usually 42 times/min[5].

**Discussion**

High temperature rutting test can directly simulate the change of rutting depth with temperature, but due to the complex rutting disease factors of asphalt pavement, temperature, traffic volume, load and driving speed may cause rutting, these factors cannot be realistically simulated in laboratory test. The actual vehicle tire pressure is also often higher than the 0.7MPa used in the standard test, and the rut test is being challenged. High temperature rutting test cannot comprehensively evaluate the high temperature stability performance of asphalt mixtures. In addition to high temperature rutting test, there are other methods for evaluating the high-temperature stability of asphalt mixtures, mainly including indoor rutting test, mechanical indicators, and large-scale full-scale tests. Among them, rutting test methods mainly include high temperature rutting test, French rut, German Hamburg rut, and American APA rut test; mechanical test methods mainly include dynamic and static load creep, modulus, and triaxial tests; full-scale test methods mainly include Large loop and straight tests. However, because there are many test methods, and the testing principles and evaluation indexes are different, the evaluation results also differ greatly. When conditions permit, multiple test methods should be used to evaluate the high-temperature stability of asphalt mixtures.

Literature

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