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# TB

NATIONAL RAILWAY INDUSTRY

STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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## TB/T 2487-2016

Replacing TB/T 2487-1994

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### Test Method for Dynamic Stress of Subgrade

路基动应力测试方法

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**Issued on: August 16, 2016**

**Implemented on: February 16, 2017**

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**Issued by: National Railway Administration of PRC**

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# Test Method for Dynamic Stress of Subgrade

## 1 Scope

This Standard specifies the subgrade dynamic stress test objectives, test principle and test points burying, test equipment requirements, sensor calibration and burying, arrangement of test results.

This Standard is applicable to the dynamic stress test of subgrade for newly-built and existing railways.

## 2 Test Objectives

**2.1** Learn the dynamic load level of subgrade, so that provide basic data for the analysis and evaluation of the subgrade structure.

**2.2** Analyze the change regularity of train load on different track types, states, and subgrade bed stress filed with new subgrade bed structure.

**2.3** Analyze the dynamic stress change regularity between subgrade and bridge, tunnel, culvert, and the like transitional section with different structures.

**2.4** Analyze the influence degree of subgrade bed disease on the subgrade bed stress.

**2.5** Verify that the subgrade bed structure is reasonable, so that provide basic data for the optimized design parameters.

## 3 Test Principle and Test Points Arrangement

**3.1** Convert the pressure into electrical signals through the pressure sensor (hereinafter referred to as sensor); use data acquisition system to record and convert the electrical signals into the pressure values.

**3.2** According to the structures of track, subgrade and transitional section, select the representative positions to arrange the test points.

- a) For ballasted track, the cross-section shall select the following positions to arrange test points as per requirements like under track, track center, sleeper end, ballast curb, and the representative positions of subgrade bed; it is shown

in Figure 1; while the longitudinal-section shall be arranged the test points under sleeper, between sleeper, and the representative positions of subgrade bed.

- b) For non-ballasted track, the cross-section shall select the following positions to arrange test points as per requirements like under track, track center, edge of track plate (track bed), edge of base seat (supporting layer), and the representative positions of the subgrade bed; it is shown in Figure 2; while the longitudinal-section shall be arranged test points on the rail support, end of track plate, middle of track plate, and the representative positions of subgrade bed.
- c) Test points shall be arranged along the depth direction on the structural layer or the middle of structural layer with different natures and different state of filler.
- d) Select the representative positions of transitional section between subgrade and bridge, tunnel, culvert.
- e) When studying the stress state under the new track, the test points can be confirmed briefly.

**3.3** Bury the qualified sensor into the to-be-tested position; connect the sensor with the acquisition system; use the acquisition system to directly record and display the stress changes on such point when the train is passing by.

**3.4** The record method of stress test shall be performed as per the relevant regulations and instructions.

## 4 Test Equipment Requirements

**4.1** The sensor and acquisition equipment for test shall meet the relevant national measurement requirements.

**4.2** The sensor shall be selected as per the following requirements:

- a) Range selection: the upper limit shall be 1.5~2.0 times of the estimated or theoretically calculated maximum stress value; while the lower limit shall satisfy that the sensor has sufficient sensitivity;
- b) The sensor shall be selected the round-cake shape; its diameter shall be no less than 10cm; the diameter of bearing surface shall be 10 times greater than the largest particle size of the soil medium;
- c) The ratio between sensor thickness of  $H$  and Diameter of  $D$  shall be no greater than 0.2;
- d) The ratio between sensor's equivalent deformation modulus  $E_g$  and soil medium deformation modulus  $E_s$  shall satisfy  $E_g/E_s \geq 60H/D$ ;

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