

Highway soft soil subgrade treatment research

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Abstract

With the development of highway, soft soil roadbed treatment has become more and more important. If mishandled, it often can cause problem such as roadbed instability or excessive settlement, this paper surrounding soft soil subgrade problems made a simple introduction.

Key words: soft soil subgrade treatment

I. The meaning of the research

In recent years ,highway of our country grows vigorously now has become a stimulating domestic demand in the highway construction, and the important factors that promote the rapid development of national economy, it attaches great importance to by governments at all levels, highways extending unceasingly, also provides favorable conditions for the development of road transport.

But as the country highway network construction extending continuously and improvement of highway design level, will inevitably encounter some problems like never before, such as highway construction inevitably encountered in the process of soft soil subgrade, and soft soil with high compressibility, big water content, low permeability, low shear strength characteristics of compression deformation and shear deformation under the action of additional stress can produce large settlement, the following problems often occur: (1) The total settlement and subsidence uneven; (2) The foundation settlement will last for years or even longer; (3) Building foundation bearing capacity is low, pavement smoothness is poor, and even form a "wave" diseases, such as the vehicle jumping, turbulence, vehicle dumping phenomenon is very serious, stability problems encountered. The following reality images often see about soft soil harm as shown in figure1~3:



Figure 1 soft soil harm case appearance



Figure 2 soft soil harm case appearance



Figure 3 soft soil harm case appearance

To solve the above problems in practical engineering, we must be to deal with natural foundation, and road in deep soft soil, after processing the post-construction settlement. Different treatment methods of differential settlement between sections is bigger also. So need to be able to solve the problem of highway soft soil treatment of the actual reinforcement method and its design theory.

II. Research status and development trend at home and abroad

2.1 The foreign research status summary

With the development of modern industry abroad, foundation engineering appeared a powerful means of production, such as to produce dozens of tons of the dynamic compaction of hoisting machinery; The emergence of submersible motor, the vibration of water jetting vibrator construction machinery, such as in recent 40 years, the foundation treatment of foreign technology development is very rapid, and the new method is also more and more. In the mid - 1960 - s, from how to improve the soil on the tensile properties of the idea of development to the reinforcement method of soil; From how to is good for soil drainage and drainage consolidation this basic viewpoint, to the development of the geosynthetic materials, sand drain preloading and plastic drainage belt; From the processing method of how to carry out deep compacted consideration, by increasing the compaction amount of measures, development of the dynamic compaction method and vibration of the compressor, to produce the high pressure jet grouting method.

2.2 The domestic research status summary

At present Soft ground treatment of highway in our country mainly concentrated in the following aspects:

(1)The basic characteristics of soft soil research:

For soft soil basic properties, people have made some consensus, generally think that the main characteristics of soft soil is: the moisture content as high as 40% 50%, more than liquid limit, void ratio greater than 1. 0, 20 plasticity index, strength $C = 10 \sim 30$ kpa, compression coefficient of $a = 0.5 \sim 1.0$ M Pa, sensitivity coefficient of 4 ~ 8. Therefore, this kind of soil settlement and drainage consolidation is slow, more can lead to poor stability of foundation.

(2)The soft foundation treatment methods

When road construction on soft soil foundation due to the physical and mechanical properties of the soft soil, on this foundation, build up the highway, the main problem is the foundation of low strength by the Dutch after deformation is big, easy to cause the foundation instability phenomenon. The appropriateness of soft ground treatment is directly related to the whole project quality, progress and investment, reasonable choice of soft ground treatment method is one of the important ways to reduce the project cost. Applied to highway soft foundation treatment method at home and abroad mainly include: in soil cushion method, dynamic compaction, the compaction method, the surcharge preloading method, the vacuum preloading method, drainage consolidation method, geogrid reinforcement method, grouting method, etc.

III. Analysis on the causes of soft soil subgrade:

(1) The geological reasons: Soft soil rich in engineering geology, swamp area filling roadbed, when increasing embankment filling roadbed will continue to produce compression settlement or extrusion displacement, thus, also with the settlement of embankment.

(2) The cause of the subgrade filling. Relevant provisions made it clear that: it contains turf soil waste not as subgrade filling, powder soil should not be directly filling roadbed.

IV. Problems existing in the expressway soft soil ground treatment

Current research of highway soft foundation treatment although has reached a considerable level. But from existing data at home and abroad, there are still some problem that not allow to ignore:

(1)Case study more, less systematic research, from the literature, the systematic theory and the practice research situation exists many defects.

(2)detecting technology needs further development of the foundation treatment effect, any kind of advanced design theory and construction method are subject to quality inspection to guarantee. The traditional methods often takes work and expensive, although the relevant specifications, quality inspection method is given but in the practical work with few instances.

(3)People usually can not correctly evaluate usability of various kinds of highway foundation treatment method.

(4)The ground treatment scheme of decision analysis research is not enough, the present scheme selection basically remain in the human thumb selection stage.

V. Highway soft soil foundation treatment method

Current expressway soft soil ground at present commonly used reinforcement technology are: stack overpressure, plastic drainage board combined with stack preloading, cement mixer, gravel pile and dynamic compaction method and other methods, in recent years, the vacuum drainage preloading method in highway on soft soil foundation reinforcement get more and more application of CFG pile and prestressed pipe pile composite foundation reinforcement method in higher highway on soft soil treatment applied.

The foundation construction safety and highway operation period as the basic principle of soft soil foundation reinforcement to determine project general sections adopted is given priority to with preloading drainage consolidation, the bridge connecting paragraphs to pile composite foundation, in addition to the consideration of post-construction settlement and engineering cost, the lower part of the embankment filling height of the bridge road connecting the vacuum combined pile load preloading method, the method has practical application in some engineering, and achieved good effect.

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