



Characteristics and Research Progress of Frost Heaving and Frost Pulling of Pile-soil System

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Abstract

The frost uplift of pile foundation or other rod-shaped structures along with the frost heave of foundation soil, is a kind of frost damage widely existing in cold region engineering. These damages have always been the main problems of railway and highway subgrade, and they are controllable factors affecting the technical indexes of subgrade in cold regions. This paper explores the evolution law, cause, characteristics, and influence factors of frost heave and uplift of pile-soil system during the freezing process. The interaction between pile and soil and the mechanism of frost heave and uplift are revealed. With the analyses on distribution at pile-soil interface and influencing factors of freezing strength, the distribution law of freezing strength at pile-soil interface is clarified. Based on the previous experimental methods of frost heaving force and uplifting force, this paper discusses the problems and limitations using current methods.

Keywords: frost heave; frost uplift; freezing strength; permafrost.

0 Introduction

Permafrost is a special type of geology, usually defined as rocks and soils that are below zero degrees Celsius and contain ice. According to the length and continuity of its freezing period, frozen soil is divided into three types: permafrost, seasonal permafrost, and short-term permafrost.

Foundation freezing is a common engineering disease in permafrost region and seasonal frozen region. The uneven uplift of piles caused by freezing causes the superstructure to tilt or collapse, resulting in serious consequences. At least more than half of the piles of canal buildings, small and medium-sized Bridges and culverts in

Heilongjiang Province suffer from frost pulling, and the amount of pile pulling can even reach tens of centimeters per year^[1]. In terms of transmission lines, 56 piles on Fengyi Line and Fengda Line, which were put into operation in 1999, were pulled up and could not be used^[2]. Numerous examples show that this is an urgent problem to be solved.

It is the primary condition for scientific prevention and control of frost heaving and frost pulling disease to explore the characteristics and influencing factors of pile and soil system in freezing process. This article through studies the freezing process under different influencing factors of pile soil interface frozen force