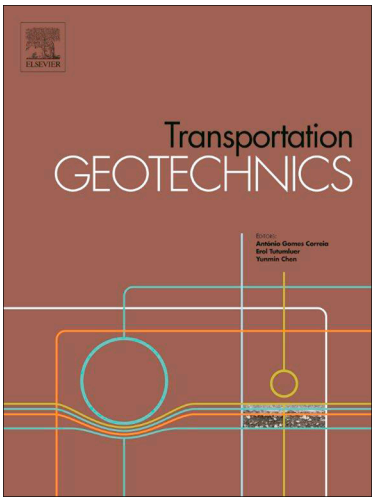

Investigation of embankment deformation mechanisms in permafrost regions

Feng Ming, Qi-hao Yu, Dong-qing Li

PII: S2214-3912(16)30079-4
DOI: https://doi.org/10.1016/j.trgeo.2018.06.003
Reference: TRGEO 174

To appear in: *Transportation Geotechnics*

Received Date: 6 October 2016
Revised Date: 9 May 2018
Accepted Date: 9 June 2018

Please cite this article as: F. Ming, Q-h. Yu, D-q. Li, Investigation of embankment deformation mechanisms in permafrost regions, *Transportation Geotechnics* (2018), doi: https://doi.org/10.1016/j.trgeo.2018.06.003

Investigation of embankment deformation mechanisms in permafrost regions

Feng Ming *, Qi-hao Yu, Dong-qing Li

State Key Laboratory of Frozen Soil Engineering, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou 730000, China

Abstract: A numerical model including heat transfer, soil compression, thaw consolidation, and creep was established to analyze the embankment deformation in permafrost. The settlement behavior of an embankment along the Qinghai-Tibet Highway was simulated using Abaqus software. The settlement mechanism was analyzed based on the distribution of additional stress and settlement at different depths. It was found that (1) the embankment can be treated as an additional load on the underlying natural ground; the additional stress is mainly distributed underneath the embankment and has an effect up to 3 m depth; (2) the large amount of heat absorbed by the asphalt pavement created a thermal disturbance that caused permafrost degradation under the embankment, and a small stress can resulting in large settlement; (3) soil compression, thaw settlement, and permafrost creep all contributed to the total settlement. The permafrost degradation was the dominant process affecting the embankment deformation. Therefore, engineering measures should be considered to protect the permafrost underneath the embankment during the design process.

Keywords: environmental engineering; permafrost degradation; thaw-settlement; creep characteristic; additional stress

0 INTRODUCTION

Frozen soil is soil or rock with a temperature below 0 ℃ (Andersland and Ladanyi, 2004; Wu et al., 2010). In recent years, infrastructure development in regions with seasonally-frozen ground and permafrost has increased (Wu and Liu, 2005). However, these activities have disturbed the ground thermal regime and resulted in permafrost degradation. For example, embankment paved with asphalt increases the heat transfer to the permafrost underlying the embankment (Wu and Niu, 2013). Permafrost may respond to this heat accumulation