Formation Mechanism and Characteristics of the Bei ' an to Heihe Expressway K177 Landslide

Journal	Advanced Materials Research (Volume 422)
Volume	Equipment Manufacturing Technology
Edited by	Jingtao Han, Sihai Jiao and Zhengyi Jiang
Pages	663-668
DOI	10.4028/www.scientific.net/AMR.422.663
Citation	Wei Shan et al., 2011, Advanced Materials Research, 422, 663
Online since	December, 2011
Authors	Wei Shan, Hua Jiang, Gao Hang Cui
Keywords	Expressway, Formation Mechanism, Landslide, Stability, Water Content Change

Abstract	Bei'an to Heihe highway is being widen to expressway at present in Heilongjiang province, some sections are located in ancient landslide bodies, influenced by the landform, rainfall, freeze thawing and anthropogenic factors, are in unstable states, bring great difficulties to construction. Took the Bei'an to Heihe expressway expansion project K177 landslide as the research object, employed the field investigation, geological drilling, field monitoring, indoor experiment and numerical simulation methods to carry an integrated study on the formation mechanism of the landslide. The research results show that: topographical, geological conditions and the water content change of slope rock and soil is the main reason causing landslide; atmospheric precipitation, seasonal freezing and thawing of the shallow soil and the island permafrost which scattered in the mountain valley melting provide a continued water source for landslide, thermal contraction cracks of slope surface and high permeability of surface rock and soil provide passage for water infiltrating, completely weathered mudstone above the aquifuge which is influenced by infiltration water to be soften forms rupture surface.

First page example

Advanced Materials Research Vol. 422 (2012) pp 663-668
Online available since 2011/Dec/06 at www.scientific.net

doi:10.4028/www.scientific.net/AMR.422.663

Formation Mechanism and Characteristics of the Bei'an to Heihe Expressway K177 Landslide

Wei Shan [1,2, a], Hua Jiang [1, b], Gaohang Cui [1, c]

[1] Northeast Forestry University, Harbin, Heilongjiang, 150040, China

[2] Harbin Institute of Technology, Harbin, Heilongjiang, 150040, China

[a]shanwei456@163.com, [b] jianghua3433@163.com, [c] cghiem@163.com

Keywords: Expressway, Landslide, Stability, Formation mechanism, Water content change.

Abstract. Bei'an to Heihe highway is being widen to expressway at present in Heilongjiang province, some sections are located in ancient landslide bodies, influenced by the landform, rainfall, freeze thawing and anthropogenic factors, are in unstable states, bring great difficulties to construction. Took the Bei'an to Heihe expressway expansion project K177 landslide as the research object, employed the field investigation, geological drilling, field monitoring, indoor experiment and numerical simulation methods to carry an integrated study on the formation mechanism of the landslide. The research results show that: topographical, geological conditions and the water content change of slope rock and soil is the main reason causing landslide; atmospheric precipitation, seasonal freezing and thawing of the shallow soil and the island permafrost which scattered in the mountain valley melting provide a continued water source for landslide, thermal contraction cracks of slope surface and high permeability of surface rock and soil provide passage for water infiltrating, completely weathered mudstone above the aquifuge which is influenced by infiltration water to be soften forms rupture surface.

Introduction

At present, Bei'an to Heihe highway is being widen to expressway in Heilongjiang province, the subgrade and slope of K159+000~K184+000 sections which traverse Xiaoxingan mountains occurred landslide in the construction process of first-stage project. In the most serious K176+500~K179+300 sections, the subgrade lost stability due to landslides after construction, were forced to change the route to build (see Fig. 1). There are many constructing highways also produced a similar situation in Heilongjiang province.

Runtian Yang [1] studied the formation, burying and distribution characteristics of the groundwater in permafrost area. Youwu Zhou [2] discussed the forming conditions, zoning principle and the evolution trend of the permafrost. Qingbai Wu [3] studied the influence of climate warming on the stability of Qinghai to Tibet Highway. Fujun Niu [4] carried monitoring study on thaw slumping slope in Tibetan Plateau permafrost area. Dewu Jin [5] studied the formation mechanism of two kinds of low angle landslide in Tibetan Plateau permafrost area. In 1999 Bei'an to Heihe highway construction initial stage, Chinese Academy of Sciences Cold and Arid Region Environment and Engineering Institution and the Heilongjiang Province Highway Construction Bureau jointly carried investigation on the geological conditions and permafrost distribution of the route through region, preliminarily studied the influence of the adverse geological conditions on the stability of highway subgrade, Biao Wang, Fansong Meng, Yan Zhang[6,7,8] represented the permafrost distribution characters, degradation state, and subgrade disease state of the Bei'an to Heihe highway through region and proposed the subgrade design principles.

At present, in the permafrost region of our country, there are few studies on the landslides which are caused by permafrost melting and anthropogenic factors. The article took the Bei'an to Heihe expressway expansion project K177 landslide as the research object, employed the field investigation, geological drilling, field monitoring, indoor experiment and numerical simulation methods to carry an integrated study on the formation mechanism of the landslide.