



Study on the Compaction Effect Factors of Lime-treated Loess Highway Embankments

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Abstract

This paper presents a study to investigate the effects of water content, lime content and compaction energy on the compaction characteristics of lime-treated loess highway embankments. Laboratory compaction tests were conducted to determine the maximum dry density ρ_{dmax} and optimum water content w_{opt} of loess with different lime Contents (0, 3, 5 and 8%), and to examine the effects of water content, lime content and compaction energy on the value of ρ_{dmax} and w_{opt} . In situ compaction tests were performed to obtain the in situ dry density $\rho_{in-situ}$ and the degree of compaction K of different lime-treated loess. Experimental embankments with different fill materials (0, 3, 5 and 8% lime treated loess) were compacted by different rollers during in situ tests. The results indicate that ρ_d increases due to the increase of water content w . Once water content exceeds w_{opt} , dry density ρ_d decreases dramatically. The addition of lime induced the increase of w_{opt} and the decrease of ρ_{dmax} . A higher compaction energy results in a higher value of ρ_{dmax} and a lower value of w_{opt} . The value of $\rho_{in-situ}$ achieves its maximum value when in situ water content $w_{in-situ}$ was larger than the value of w_{opt} (+1-2%). The degree of compaction K can hardly be achieved to 100% in the field construction of embankments. Higher water content and compaction energy is needed for optimum compaction.

Keywords: Lime-treated Loess; Highway Embankments; Loess Compaction; Degree of Compaction.

1. Introduction

Loess is one of the wind deposited soils, which is widely distributed and constitute about 10% of the total land area of the world [1-3]. China has a large area of loess soil deposits in the world (about $6.3 \times 10^5 \text{ km}^2$). The world famous Loess Plateau is located at northwest of China, which occupies more than 6% of the territory of China [4-6] (Figure 1).

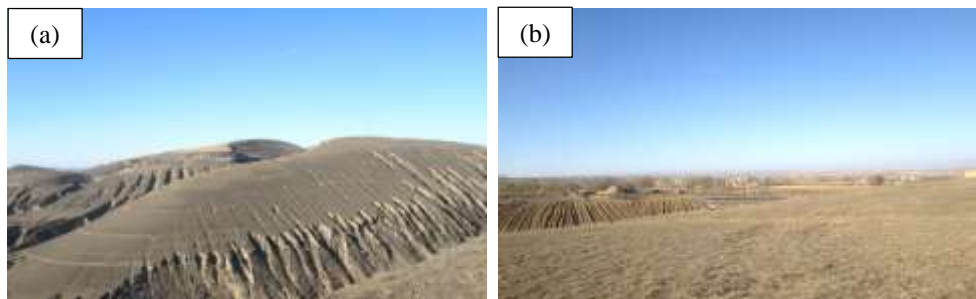


Figure 1. Loess Plateau area located at northwest of China. (a) Loess area at Yan'an city; (b) Loess area at Yulin city

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