

Electronic Supplementary Materials

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Evaluation of heavy roller compaction on a large thickness layer of subgrade with full-scale field experiments

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S1

For the traditional sand cone test with the drop distance less than 30 cm, the volume of testing pit was determined by the weight of falling sand divided by its density in the pit, which was considered the same to the initial density in the sand barrel. However, since the drop distance of testing sand was up to 65~80 cm for the compactness tests of the large lift thicknesses, the sand density falling in the testing pit should be calibrated according to the actual drop distance. Therefore, a series of PVC barrels with an inner diameter of 25 cm were cut into segments of 15~65 cm in length to simulate different pit depths in the compactness tests as shown in Fig. S1. Meanwhile, a steel sand barrel was also manufactured with the inner diameter of 25 cm and length of 65 cm. The density of falling sand in the PVC barrels with different drop distances was first tested in laboratory according to the test methods specified in the Chinese Code JTG 3450 - 2019. Fig. S2 presents the measured density of falling sand in the PVC barrel, which shows an increasing trend with the drop distance. It indicates that in the compactness test using sand cone method, the sand density should be calibrated with the actual testing pit depth. Otherwise, it will underestimate the density of compacted subgrade with large lift thickness. An empirical formula was proposed to represent the approximately linear relationship between the sand density and testing pit depth as Eq. (S1):

$$\rho_s = 1.525 \pm 0.002 + 9.648 \pm 0.592 \times 10^{-4} \cdot h_{tp} \quad (S1)$$

where ρ_s is the density of falling sand, g/cm³; h_{tp} is the depth of the testing pit, cm.



(a) PVC sand barrel (b) Steel sand barrel
Fig. S1 Instruments to calibration the sand density

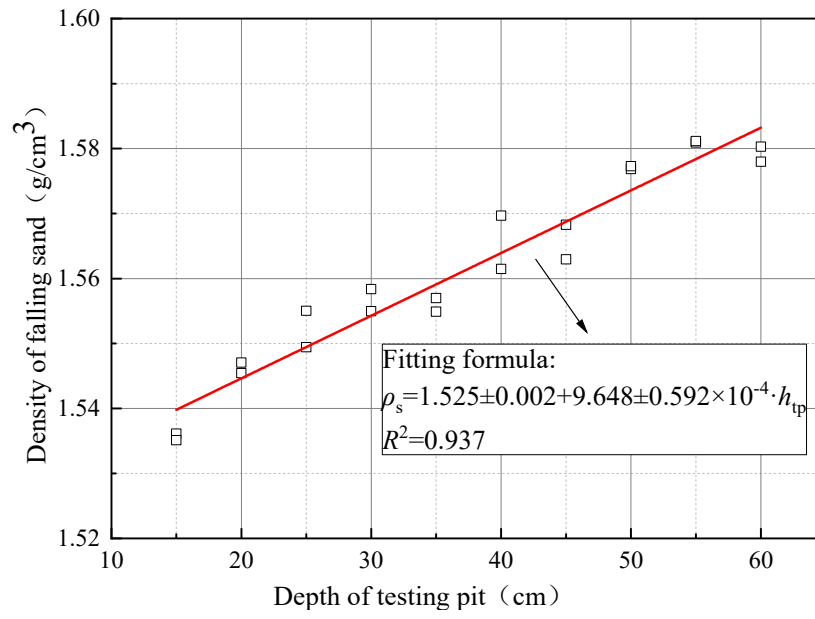


Fig. S2 Relationship between sand density and drop depth