The Dynamic Response and the Residual Deformation of Ballast Layer under Cyclic Impact Loadings

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Cyclic impact loading tests were performed both experimentally and numerically to examine the effect of impact loading on both dynamic response and settlement of a shallow granular layer like a ballasted layer. It was found that residual settlement under cyclic impact loadings are increased compared with another one under 'Standard' cyclic loadings. PIV results suggest that the above mentioned results are caused by the dynamic response of grains during impact 'off-loading', which can loosen the granular columns and lead to a volumetric increase. Furthermore, DEM results show that many grains loss contact points during impact 'off-loading'. Then 4 patterns of loading waves are applied to the discrete ballasted track model by DEM simulations. Those results also show that impact loadings increase both dynamic response and residual settlement of the model.