FEM analysis of backfilling sequences on the behaviour of gravity type retaining wall

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Gravity retaining walls derive their capacity to resist lateral movement through the dead weight of the wall. The design methodologies proposed by standards do not take into account the construction sequences that simulate the process by which the soil and retaining wall are brought together. However, in reality, at least during the backfilling process, the retaining wall undergoes many displacements that are not so far considered in the design. In this investigation, effect of construction sequences in the gravity retaining walls with different shapes is investigated with the help of finite element method. Two different construction sequences, namely the backfilling after wall construction and the backfilling parallel to wall construction, are compared for different wall shape models. Lateral displacement of the bottom and the top of the wall is plotted for each model and construction sequence with construction stages. Bearing pressure distribution, lateral earth pressure and failure wedge angle are summarized and compared with design values. Each wall showed different behaviours for each of the construction sequences. Back filling after wall construction minimizes the sliding failure and bearing pressure. Overturning failure could be reduced by backfilling parallel to wall construction. However, it was observed that, comparatively, backfilling after wall construction is effective than backfilling parallel to wall construction, suggesting that proper selection of construction method also may reduce negative effects on the wall stability.

Key words: Gravity retaining wall, construction sequence, numerical modelling, backfilling, lateral displacement

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