

不同退縮距離對膠結不良砂岩淺基礎承載行為之影響

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摘 要

本研究旨在由室內淺基礎模型承載試驗，探討當基礎置於膠結不良砂岩邊坡頂部時，不同退縮距離對承載行為之影響。藉由承載曲線及觀察窗(250mm×400mm)觀測承載試驗時人造膠結不良砂岩之裂縫產生順序，瞭解其破壞模式及不同退縮距離對基礎承載力的影響。

由觀察得知，基礎下方岩體破壞時，依應力種類及彈、塑性變形之不同，概略可分為基礎正下方三角楔形之主動壓力區，最外側鄰近自由表面之被動壓力區，於此兩區間傳遞應力及產生塑性變形之區域為輻射應力區。

當基礎置於水平地表，基礎兩側岩體均能提供概略相同之承載力，故基礎兩側之破壞模式概同，承載力亦較高；然當基礎置於邊坡頂部時，因基礎近邊坡側之岩體相較於平面側較小，因此當基礎下方主動壓力區向兩側推擠時，破壞較集中於邊坡側發展，往往當平面側尚未破壞，即其承載力尚未完全發揮時，邊坡處被動壓力區及輻射應力區之岩體因裂縫開裂擴大且相互連通而破壞，基礎下方主動區即因失去側向支撐向邊坡處滑動而達極限承載力。

邊坡頂部基礎承載力隨基礎位置不同而改變，緊鄰邊坡時承載力

最低，隨基礎距離邊坡距離增加，承载力隨之漸增，當基礎與邊坡之距離大於滑動破壞弧時，基礎承载力便不受邊坡影響，就本研究膠結不良砂岩淺基礎承载試驗結果，當基礎距離 20° 邊坡三倍基礎寬度時（15cm），承载力受邊坡之影響可以忽略，但承载行為仍受邊坡影響，其破壞模式與水平地表仍有不同。

關鍵字：人造膠結不良砂岩、模型承载試驗、破壞機制、基礎退縮距離
主動壓力區、被動壓力區、輻射應力區、完整區



Effect of Setback Distance on Loading Behavior of Shallow Foundation in a Poorly Cemented Sandstone

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ABSTRACT

This study aims to investigate the effect of setback distance on the loading behaviors of the shallow foundation located on the crest of a slope of poorly cemented sandstone. Based on the loading curves and the phenomena of crack development during loading, the effect of setback distance of foundation bearing stress and the failure mechanisms are explored.

From the observation, the foundation rock after failure can be categorized into three zones, the triangular active zone beneath the footing, the outer passive zone near the free surface and the transition zone between both.

For a footing located on a horizontal ground, a symmetric failure mode with respect to the footing is observed at the foundation rock. Due to the existence of a slope, the failure mode of foundation rock for the footing located on a crest of an inclined ground is different with the footing on a horizontal surface. Because the volume of active zone at the slope side is less than that in the side of level ground, major fractures are developed at the active zone of the slope side. Consequently, the

passive and transition zones connect and induce ruptures in the slope side. The ultimate bearing stress measured is due to lack of lateral support at the slope side, meanwhile the rock in the level ground side does not contribute to the bearing stress.

Based on the experimental results, the fact reflects that the bearing capacity of the foundation on the slope crest varies with its setback distance. The bearing capacity increases with the increase of setback distance. The slope will not influence the bearing capacity while the failure surface does not extend to the slope. According to the results of loading tests conducted in this study, the bearing capacity is independent of the slope when the setback stance is more than 3 times of the width of the foundation (15 cm).

Keywords : artificial poorly cemented sandstone , soft rock, foundation model for loading test , failure mechanism, setback distance, active zone, passive zone, transition zone, intact zone

