Effects of Adjacent Rock Face Inclination on Earth Pressure At-Rest

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Abstract

This paper studies the effects of adjacent inclined rock face on earth pressure at-rest. Dry Ottawa sand was used as backfill material. Horizontal earth pressures in loose (D_r = 35%) and compacted (D_r = 72%) soil mass were measured. The height of backfill is 1.5 m. The instrumented model retaining-wall at National Chiao Tung University was used to investigate the lateral earth pressure at different rock face inclination angles α. To simulate an inclined hard rock face, an interface plate covered with Safety-Walk (anti-slip material) and its supporting system were designed and constructed. The interface inclination angles $\alpha = 0^o$, 45^o, 60^o, 70^o, and 80^o. Base on the test results for loose sand, the following conclusions can be drawn.

1. The distributions of lateral earth pressure are not linearly with depth for the interface inclined at $\alpha = 0^o$, 45^o, 60^o, 70^0 and 80^o. The measured horizontal pressure σ_h is lower than Jaky's solution, and σ_h decreased with increasing α angle.
2. Without the interface plate ($\alpha = 0^o$), the coefficient $K_{o,h}$ is slightly less than Jaky solution. The point of application h/H of the at-rest earth pressure is located at about 0.33 H above the base of the wall. The coefficient $K_{o,h}$ decreases with the increase of the rock face inclination. The total soil thrust rises to higher locations with increasing interface inclination angle α.
3. An empirical relationship between the coefficient $K_{o,h}$ and the interface inclination angle α can be established: $K_{o,h,\alpha} = K_{o,h,Jaky} - 0.00462 \times \alpha$. This equation is

applicable for loose sand for $0^o \le \alpha \le 80^o$.

Base on the test results for dense sand, the following conclusions can be drawn.

1. After compaction, the lateral stress measured near the top of backfill is almost identical to passive earth pressure. Below the compaction-influenced zone for α = 0^o, the lateral stresses converge to the earth pressure at-rest based on Jaky's equation.
2. The coefficient $K_{o,h}$ decreases with the increasing of the rock face inclination. The point of application h/H of the total thrust rises to a higher location with increasing interface angle.