

Slope Stability Problems Associated With Mudrocks in the Midwestern States of the USA

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Mudrocks (shales, claystones, mudstones, siltstones) dominate the flat-lying sedimentary sequences in the midwestern states of Ohio, Pennsylvania, and West Virginia. The claystone and mudstone strata in these states are characterized by low to very low durability, low shear strength, and high shrink-swell potential. Where shale, claystone, and mudstone strata alternate with layers of sandstones, siltstones, and limestones, differential weathering, resulting in undercutting, is prominent. Residual soils overlying the mudrocks are also well-known for their inferior engineering properties and highly erodible nature. This type of soil-rock stratigraphy is conducive to a variety of slope movements including rock falls, plane failures, wedge failures (promoted by undercutting), rotational slides, and flows. Shallow translational slides, occurring along contacts between residual soils and underlying mudrocks, are also quite common.

In a study undertaken to investigate how the engineering properties of mudrocks affect the rate of undercutting, the amount of undercutting was measured at 14 roadcut sites in Ohio, Pennsylvania, and West Virginia. The maximum amount of undercutting at each site was divided by the time since the original excavation to obtain the rate of undercutting. The rate of undercutting was then correlated with the slake durability values of the undercutting units to develop prediction equations for estimating the rate of undercutting for different types of mudrocks. The slake durability index was also found to be a good indicator of the susceptibility of mudrocks to rotational and flow type movements. This type of information is essential for timely implementation of preventive measures.