World Academy of Science, Engineering and Technology
International Journal of Geotechnical and Geological Engineering
Vol:16, No:06, 2022

Q Slope Rock Mass Classification and Slope Stability Assessment Methodology Application in Steep Interbedded Sedimentary Rock Slopes for a Motorway Constructed North of Auckland, New Zealand

Authors : Azariah Sosa, Carlos Renedo Sanchez

Abstract : The development of a new motorway north of Auckland (New Zealand) includes steep rock cuts, from 63 up to 85 degrees, in an interbedded sandstone and siltstone rock mass of the geological unit Waitemata Group (Pakiri Formation), which shows sub-horizontal bedding planes, various sub-vertical joint sets, and a diverse weathering profile. In this kind of rock mass -that can be classified as a weak rock- the definition of the stable maximum geometry is not only governed by discontinuities and defects evident in the rock but is important to also consider the global stability of the rock slope, including (in the analysis) the rock mass characterisation, influence of the groundwater, the geological evolution, and the weathering processes. Depending on the weakness of the rock and the processes suffered, the global stability could, in fact, be a more restricting element than the potential instability of individual blocks through discontinuities. This paper discusses those elements that govern the stability of the rock slopes constructed in a rock formation with favourable bedding and distribution of discontinuities (horizontal and vertical) but with a weak behaviour in terms of global rock mass characterisation. In this context, classifications as Q-Slope and slope stability assessment methodology (SSAM) have been demonstrated as important tools which complement the assessment of the global stability together with the analytical tools related to the wedge-type failures and limit equilibrium methods. The paper focuses on the applicability of these two new empirical classifications to evaluate the slope stability in 18 already excavated rock slopes in the Pakiri formation through comparison between the predicted and observed stability issues and by reviewing the outcome of analytical methods (Rocscience slope stability software suite) compared against the expected stability determined from these rock classifications. This exercise will help validate such findings and correlations arising from the two empirical methods in order to adjust the methods to the nature of this specific kind of rock mass and provide a better understanding of the long-term stability of the slopes studied.

Keywords : Pakiri formation, Q-slope, rock slope stability, SSAM, weak rock
Conference Title : ICRSE 2022 : International Conference on Rock Slope Engineering
Conference Location : Paris, France
Conference Dates : June 23-24, 2022