

Slope stability analysis of Londalen Landslide in Norway by using ordinary method of slices and bishop's modified method

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Abstract

This research was carried out at Natural Hazards and Disaster Recovery, Niigata University Japan. The slope stability analysis was performed to assess the safe and economic design of a human-made or natural slopes (e.g. embankments, road cuts, open-pit mining, excavations, landfills etc.) and the equilibrium conditions. The term slope stability may be defined as the resistance of inclined surface to failure by sliding or collapsing. The main objectives of slope stability analysis are finding endangered areas, investigation of potential failure mechanisms, determination of the slope sensitivity to different triggering mechanisms, designing of optimal slopes with regard to safety, reliability and economics, designing possible remedial measures, e.g. barriers and stabilization. Successful design of the slope requires geological information and site characteristics, e.g. properties of soil/rock mass, slope geometry, groundwater conditions, alternation of materials by faulting, joint or discontinuity systems, movements and tension in joints, earthquake activity etc.

Fellenius (1927) developed this method further, creating a method known as the Ordinary Method of Slices, or Fellenius' Method. Fellenius' Method simplifies the equation by assuming that the forces acting on the sides of each slice cancel each other. Using the same approach, Bishop (1955) refined the method of slices technique by accounting for the interslice normal forces, thus calculating the Factor of Safety with increased accuracy. The method of slices he developed is known as the Ordinary Method slice (Bishop 1955).

Data pertaining to slope stability analysis was manipulated with hand-held calculator. One case was analyzed; it was a real case of Londalen landslide in Norway. First Ordinary Method of slice was calculated in which the slices calculated on the basis of the dimensions slice and unit weights of the soils within them and using the mathematical formula getting final result of londalan landslide is $F_s = 0.99$. The using the Bishop's modified method the final result of the londalan landslide was different $F_s = 1.12$.