# ENGINEERING PROPERTIES AND SLOPE STABILITY ANALYSIS OF LIMESTONE IN BADSHAPUR AND MAGHAL AREAS, CENTRAL SALT RANGE, PUNJAB, PAKISTAN

**Moaazam Abbas, Sohail Akramb, Rana Ammad Bin Sadiq, and Nasir Somro**

*Resident Consultant (Geo-RC), Lahore*
*University of the Punjab, Lahore*
*University of the Punjab, Lahore*
*Geological Survey of Pakistan, Lahore*
*Correspondence email*: moazam_geo@hotmail.com*

**Abstract**

This research is an attempt to evaluate the engineering properties and slope stability of limestone in Badshapur and Maghal areas, Central Salt Range, Punjab, Pakistan. Geological mapping was undertaken to record necessary surface geological information. Drilled boreholes data was analyzed to interpret subsurface lithology whereas the engineering properties of rocks were determined by laboratory experiments. The surface and subsurface studies showed that geology of the Badshapur-Maghal area comprised a succession of Chorgali formation, Sakesar limestone and Namal formation. In order to determine engineering properties of limestone five core samples from each formation were taken from boreholes and different laboratory tests (Schmidt rebound hammer value, Uniaxial compressive test, Point load test) were performed. Result shows that UCS value by Schmidt rebound hammer test for Choragali formation is 71.42 Mpa) which depicts medium strength rock according to ISRM (1979), average value for Sakesar limestone is (76.32 Mpa) which correspondences to medium strength. The Namal formation with (61.93 Mpa) also corresponds to medium strength. By Uniaxial compressive test, average UCS value of Chorgali formation is (30.29 Mpa) showing moderate strong rock, Sakesar limestone with UCS value (50.05 Mpa) is medium strong, and Namal formation with average UCS (38.62 Mpa) is moderately strong. The UCS value determined by Point load test for Chorgali formation, Sakesar limestone and Namal formation is 58.32, 63.21, and 60.28, respectively and showed that all three formations show medium strength. In order to determine slope stability of rock masses two scaneline surveys were conducted and kinematic/stereographic analysis were performed by computer program "DIPS 5.1 (RocScience)". The scan line survey showed that there are two major sets of joints. J1 has average 75/260 dip/dip direction and J2 has average 60/070 dip/dip direction. The kinematic analysis showed that plane failure is likely to occur along many joints of joint set-1 and. From surface and subsurface studies it is concluded that all the formations are suitable for building engineering structures but along joint set-1 remedial measure should be necessary in order to avoid plane failure.