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Factors Affecting the Ultimate Compressive Strength of the Quaternary Calcarenites, North Western Desert, Egypt

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Abstract : The calcarenites carbonate rocks of the Quaternary ridges, which extend along the northwestern Mediterranean coastal plain of Egypt, represent an excellent model for the transformation of loose sediments to real sedimentary rocks by the different stages of meteoric diagenesis. The depositional and diagenetic fabrics of the rocks, in addition to the strata orientation, highly affect their ultimate compressive strength and other geotechnical properties. There is a marked increase in the compressive strength (UCS) from the first to the fourth ridge rock samples. The lowest values are related to the loose packing, weakly cemented aragonitic ooid sediments with high porosity, besides the irregularly distributed of cement, which result in decreasing the ability of these rocks to withstand crushing under direct pressure. The high (UCS) values are attributed to the low porosity, the presence of micritic cement, the reduction in grain size and the occurrence of micritization and calcretization processes. The strata orientation has a notable effect on the measured (UCS). The lowest values have been recorded for the samples cored in the inclined direction; whereas the highest values have been noticed in most samples cored in the vertical and parallel directions to bedding plane. In case of the inclined direction, the bedding planes were oriented close to the plane of maximum shear stress. The lowest and highest anisotropy values have been recorded for the first and the third ridges rock samples, respectively, which may attributed to the relatively homogeneity and well sorted grain-stone of the first ridge rock samples, and relatively heterogeneity in grain and pore size distribution and degree of cementation of the third ridge rock samples, besides, the abundance of shell fragments with intra-particle pore spaces, which may produce lines of weakness within the rock.

Keywords : compressive strength, anisotropy, calcarenites, Egypt
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