Compressibility and swelling characteristics of Al-Khobar Palygorskite, eastern Saudi Arabia

Aiban S.A.

Engineering Geology
Vol. 87, Issue.4-Mar, 2006

Abstract: Expansive soils are found in different locations in eastern Saudi Arabia. The area is arid with high temperatures, highly variable humidity and an excessive rate of evaporation compared to the low precipitation. This resulted in the formation of water sensitive soils. In the present investigation, line valve buildings for a sweet water feeder (1118Â mm in diameter) were constructed on a highly expansive material consisting mainly of brown palygorskite and gray palygorskite with thin sheets of gypsum and limestone. Block samples from both palygorskites were brought to the laboratory and cores as well as remolded samples were obtained from the blocks. The two palygorskites were found to be highly plastic and have a very high swelling potential. The liquid limit (LL) and plastic limit (PL) values for the brown palygorskite are 261% and 140%, respectively. The gray palygorskite has a LL of a 285% and a PL of 123%. The oedometer free swell tests for the two palygorskites produced an expansion ranging between 31.8% and 42.5% for the remolded samples. However, the expansion for cores ranges between 8.3% and 19.3%. The constant volume pressure tests produced a stress in excess of 4240Â kPa. The swell potential reached a steady state after four days while the swelling pressure reached a steady state in about 3Â h. The paper addresses the geology of the area, the characterization of the geomaterial including mineralogical composition using X-ray diffraction and SEM techniques and the swelling characteristics of the material.