**Title:** Mechanics of Barrette and Combined Pile-Raft Foundation Systems for Super Tall Towers - Theory and Practice

**Abstract:** A significant number of super tall towers in the recent decades are constructed around the world and in particular in the Middle East region, where the foundations derive strength from soil or weak and weathered carbonate rocks. In this study by highlighting the significant use of both combined pile-raft foundation (CPRF) system and barrette foundations across the globe including the effectiveness during earthquake conditions, theoretical geomechanics of the problem are handled with practical applications. The design of foundation system for the proposed 100 story HDS tower, Dubai, to be constructed within a footprint area of about 90m by 60m, is presented in detail. Foundation design for the tower was a challenge due to the requirement to transfer heavy foundation loads of 45 to 55 MN per pile to the weak carbonate rocks within the limited footprint area. Barrette foundations are efficient alternative to bored cast in situ piles which for the same volume of concrete, offer significantly higher bearing capacity. The foundation design using barrettes were compared against design of large diameter bored piles and barrette of size 1.2m x 2.8m with an equivalent pile diameter of 2.07 m is found to have 23% more perimeter there by generating higher friction capacity for the same volume of concrete. This lead to selection of economical and stable Barrette foundations, resulting in significant savings in time and cost.