



Leaning Buildings on Alluvial Deposits at Southeastern Region of Mexican Republic. Evaluation and Solution.

Oscar Cuanalo

Benemérita Universidad Autónoma de Puebla, Puebla, México (cuanalooscar@gmail.com)

The southeast region subsoil of Mexican Republic is made up of alluvial deposits transported by the different rivers flowing to the Gulf of Mexico (Usumacinta and Grijalva), which deposit along their riverbed different materials including sands, compressible fine soils such as clays and silts, organic soils, peats and their mixtures, producing a very heterogeneous and erratic stratigraphy as in vertical direction as horizontal.

From Geotechnical point of view these alluvial soils are materials of low shear resistance and high compressibility; in addition due to the flat morphology of the terrain and the intense rains, the soil remains saturated most of the year. Structures or buildings built on this type of ground, including bridges, buildings, housing units, storage tanks, platforms and drilling towers, road embankments and viaducts, among others, may experience large settlements or differential subsidence causing the inclination of structures (angular distortions) which exceed the permissible values in their service limit state specified in the building codes. The aforementioned can cause serious damages to structures or even the collapse of these constructions which represents a Threat and Potential Georisk for people and their properties.

In this article a historic case of one housing buildings at Villahermosa city, in Tabasco México is presented, where there have been differential settlements up to 25.8 cm in 10 m long (building width). The subsoil stratigraphic profile and its physical and mechanical properties are characterized from the geotechnical point of view. Furthermore also the constructive works used to solve the inclination buildings problems are described, including under-excavation and hydrofracturing cement grout injection into the subsoil; the same procedures as they were used to reduce the inclination of Metropolitan Cathedral in México's city and the Leaning Tower of Pisa in Italy in order to preserve both monuments of the world heritage. The first procedure consist in extract small volumes of material into the subsoil of the higher part of the area in order to reduce the differential settlements and level the structures; and the second one consist in the differential cement grout injection into the subsoil to equal the additional settlements that the ground will suffer in the future due to the different strata thickness and the different consolidation degree of the soft soil.