

Foundation Development from 1890-1942 for Long span and High Rise Buildings at México City

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ABSTRACT

The subsoil of Mexico City has had a complex behavior; filled with light flocculent structure and layers at different depths of stronger material, producing regional and local differential settlements and liquefaction being a seismic zone.

Long Span and High Rise buildings in this City have been a challenge to construct, being its foundation solution one of the essential elements for its success. First long-span steel buildings built around 1890 introduced solutions used at the United States first buildings called grillage. The iron and steel grillage was used for every building until differential settlements appeared in most of the essential and massive buildings built around 1903-1905 as the Art Palace or Legislative Palace.

Taking this into account and taking as reference the construction technics used at the United States, the first skyscraper built around 1930 considered wood piles under a raft foundation. Even it was a successful solution, problems as emerging and negative friction appeared (this concept was not studied at all by the time). In 1933 a Mexican engineer considered a floating foundation for a new skyscraper. By that time, it was known the elastic and plastic reaction of the soil under different stresses, but Mexican structural engineers lacked formulas and coefficients, and there was not available a Geotechnical Laboratory in the city, so it was a great achievement by the time with a complex structural solution.

Floating cellular raft foundations were a successful solution for a long span and high rise buildings built at Mexico City, until 1940 when an earthquake stroke and some buildings got damage: groundwater ingress through the basement walls producing settlements and undesirable seismic behavior. Soil Mechanics of the city center started to be studied by many Mexican engineers, achieving new foundations solutions as control piles or mixed foundations systems: concrete piles under cellular raft foundations. It was the beginning of a new era building the highest skyscraper in Latin America: Torre Latinoamericana.

This study aims to present the evolution of the long span and skyscraper at Mexico City, being the foundation solution the most crucial issue at the beginning of this new construction era. Analyzing structural and geotechnical the foundation solution of five of the most famous buildings and skyscraper built during this period, the advantages and disadvantage for each type are presented, arriving at one of the solutions most used today for this kind of buildings.

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