Measurement and Temporal Analysis of Performance and Movements of Building Foundations

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SUMMARY

Measurement of the movements and deformation of building foundation structures can currently be performed using geodetic measurement techniques using automatic level, total station, GNSS receivers, hydrostatic communicating vessel systems, geotechnical instrumentation using extensometers and inclinometers and techniques for InSAR remote sensing satellites. The measurement technique adopted depends on the amplitude of the physical quantities to be measured and monitored: displacement, velocity and acceleration of object points defined in the building structure. In the metropolitan region of Recife-PE, Brazil, there are several examples of works that present the most varied design solutions related to the study of the behavior of building foundations. The effect of the loading state variation applied on the structure of the building, during the construction and post-construction phases, interferes with the stresses of the various layers of the soil on which the building was built, causing movements of the structural elements of the building's foundations. These movements, from certain limits of magnitude, may generate damage and structural pathologies. The total settlings, differential settlings, rotations, relative deflections, lateral displacement and inclination can be highlighted from the possible movements of the foundations of buildings. This paper will present the various settling measurements performed with the work of digital level supported by reference points of stagnant levels, defined and executed off-site benchmarks (level references) and on-site benchmarks (level references), the latter being used for altimetric transport at the moment of the measurement of settling pins. Proper care in the execution of the various level reference points is of fundamental importance in order not to compromise the reliability and quality of the settling measurements. Studies show the stability of two types of reference points: in the first, located in the vicinity of the construction with deep rods anchored in stable soil layers and in the second, reference points set in pillars of a building built over 50 years ago performed on cast-in-place concrete structures of the Franki pile type located outside the site, to the detriment of surface level references located on the sidewalk near the construction and / or

located two meters deep in the vicinity of the construction. Measurements are made through the settling pins fixed in the building pillars. For the temporal analysis and monitoring of the settlements, 41 pillars were selected from the total 87 pillars of the building for the materialization of the settling pins, to be periodically measured at predefined intervals according to the development of the construction and the results achieved. Through the measurement data performed, the calculations of angular distortions between the respective monitored pillars are verified. In the same way, the various graphs are constructed: Settling x time, Settling speeds x time, 2D and 3D settlements through interpolation curves. This way, it is possible to evaluate the structural behavior of the building, as well as to follow and evaluate the settlings until it is stabilized, verifying if the projected performance was reached.