Investigation of the Control and Monitoring of Onshore Wind Structures, Buildings, Built And/or Natural Soils with the Employment of Geodetic Measurement

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SUMMARY

This article presents applied geodesy approaches to monitor the structural conditions of buildings, onshore wind towers, built and natural soils, which are the least contemplated with dimensional control. This control is provided by the applications of geodetic measurement methods, especially using the GNSS system and terrestrial measurement methods. The measurement methods are responsible for determining the exact position and area of the building and other concrete and/or metal structures to be built or already built. They also investigate, over time, if they suffer deformation, o prevent natural and structural risks. The geometric and dimensional representation of these structures were carried out from the geodetic survey, defined based on the geodesic vertices of an official reference system. The connection of these structures (measurement objects) to a Geodetic Reference System, occurred through reference points, measured by GNSS Positioning methods and Terrestrial Measurement Methods, and thus being able to have a one-dimensional, two-dimensional and/or three-dimensional character to be investigated over time. The studies of wind towers and inclined land susceptible to settlements and landslides were carried out from an altimetric network in a wind farm, located in the municipality of Gravatá-PE, Brazil, involving two wind towers and the area around them, taking measurements at four different times, and applying very high-precision geometric leveling. In all, the elapsed interval was 536 days. Altimetric elevations were adjusted via parametric model of the Least Squares Method (LSM), applying quality tests of the Chi-Square distribution. The geodesic network of planialtimetric reference that involved the wind towers was expanded with the implantation of points at the bases of the towers and encrusted in the rocky outcrops on the ground. With technological advances and the advent of the laser profiling technique, it is possible to obtain planialtimetric data with high precision. The trust and certainty of the quality of the point clouds are extremely important for them to be used in the generation of cartographic products with the discretization of buildings. In this context, the creation of a geodesic infrastructure is of fundamental importance to enable the control and

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verification of the quality of this product. Thus, in Olinda-PE, Brazil, these experiments were carried out in the Historic Center. In this context, this work aims to address the geodetic measurements developed in the discretization of the cited structures, also establishing metrological reference standards for data acquisition and use of methods and instruments in the field. All approaches were real cases of experiments, contributing to the reduction of the dichotomy between theory and practice, and improvement of practical activities developed in the Geodetic Engineering Area, involving academic and professional activities through the development of projects, which involve subjects correlated to the area of Architecture and Urban Planning and Cartographic, Surveying, Civil and Mechanical Engineering.