Investigation of Displacements in Engineering Structures after Earthquakes Using both Conventional and Satellite Geodetic Techniques

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ABSTRACT

Natural disasters, earthquakes, landslides flooding, are very dangerous natural events for humanbeings every time. Turkey is also threatened under the natural disasters. Regarding the tectonic structure, earthquake is one of the most important natural phenomena in Turkey. Also, it is affecting country's economy. The latest major earthquakes hit eastern Marmara on August 17th and November 12th 1999. North Anatolian Fault Zone (NAFZ) is located in and around this region. A lot of people either injured or dead and many engineering structures, buildings, railways, viaducts, tunnels were damaged by these earthquakes. Bolu pass consists of two viaducts and a tunnel. This pass is between Kaynaşlı/Bolu and Elmalık/Bolu, which is about 25 kilometer. Viaducts and tunnel connect Ankara-Istanbul Motorway on Trans-European Motorway (TEM).

In this study, post-earthquakes displacements of the Bolu viaducts have been investigated. In order to investigate the deformation in the area due to two earthquakes, first of all the geodetic network of project were investigated in the field to find out the present status of network. After this investigation new stations were established instead the lost or damaged ones. Thereafter, new control stations were established to densification the present geodetic network for future use to continue the Viaducts and a tunnel project. Then new control stations were established in between the piers of Viaduct I to investigate the damage on the piers. At last new control stations were added at both end of tunnel to investigate also damages of tunnel due to the earthquakes. Having completed the control station establishment, measurement campaign were carried out on control stations and detail points using high-tech geodetic instruments, like Global Positioning System (GPS) receivers, total stations, precise levels to establish the connections between the control stations and detail points.

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