

Evaluation of leveling networks to monitor vertical Displacement of sensitive engineering structures*

Dr. Wael Radwan**

Abstract

Monitoring vertical and horizontal displacement, in sensitive and important structures is considered a very important aspect that has to be properly studied to reduce cost and ensure safety perspectives and durability of the structure itself.

When monitoring vertical displacement, a special leveling network has to be established and very accurate instruments and measurements methods have to be used and applied. Nevertheless, we may not notice any vertical displacement in spite of our previous knowledge the structure is deforming.

The shape and geometry of the network play a major role in lessening work load, and leading to the detection of the deformation with least physical, duration, and technical effort. In other words, we need to evaluate the accuracy of the network before we start the monitoring process.

The author suggests that, this evaluation has to be achieved through the selection of proper weight units assigned to height differences based on the average vision ray distance. According to him, this selection is better than calculating the mean square error of high differences, which usually is taken proportional to one kilometer (1km) of leveling distance.

With the suggested approach, the weakest point is determined based on its weight number, which in turn allow the evaluation of the network sensitivity, then its ability to show any vertical movement that may occur.

Usually all allowed values or tolerance limits are given by the contractor (the project owners).

Key words: deformation, vertical displacement, vision ray distance, weight unit of high differences,

* For the paper in Arabic see pages (23-33)

** lecturer in faculty of civil engineering – Damascus University