

Important methods measurements to exam the accuracy and reliability of reflector-less total station measurements

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Abstract

Inaccessible points are difficult to measure because the prism cannot be position in these points, so reflector-less total station has solved this problem and these points can be measured easily. But the vital question is, if these measurements are accurate and reliable. This research has carried out to identify the vital methods measurements that have to be done to identify the reliability and the exact accuracy of the reflector-less measurements. Results are not general for all total station types because each instrument has its own specifications, and the continues use of the instrument (old used instruments) could affect the accuracy of measurements. In the third world countries or in specific in our cities, old version surveying instruments are still used in most projects. In some projects specially in high accuracy projects (such as bridges monitoring by using total station), it is important to know the exact distance that errors are going to be introduced by using reflector less total station (the distance between the target and the instrument). By identifying the limitations, the errors can be avoided, and the required accuracy can be obtained. In this research many observations in different locations are carried out in two situations, the first one by using prism and the second one by using reflector less mode to compare between them. This study has identified many aspects include: the effects of beam divergence and the incidence angle on the accuracy and reliability of the measurements. In addition, the limitation of the reflector-less technology when the high accuracy is required. Furthermore, it has suggested the solution to this problem. In this research methods measurements to exam the reliability and the exact accuracy of the reflector-less measurements have been identified for total station Topcon ES-103, and these methods could be used to any type of total station before start in any high accuracy project. When the reflector-less measurements limitations are identified, the errors could be avoided.