

Study on Modernizing the General Standard of Operation Specifications for Public Surveys (2) Estimation of Uncertainties Regarding the Proposed Operation Specification for Control Surveys

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SUMMARY

In our previous paper (Murakami, FIG WW 2023), we reported the overview of the study on the modernization of the General Standard of Operation Specifications for Public Surveys (GSOS). GSOS is provided by the Geospatial Information Authority of Japan (GSI), the national geospatial organization, served as a model for public organizations to conduct surveying and mapping and we, as a private sector, set up a study group and have been developing new specifications to modernize GSOS.

As the first step of progress, we proposed control surveys with a simpler structure of two tiers of control points instead of traditional four. The first-tier points are set up by using only GNSS and CORS, consisting of a regional network with the interval of about 200m-500m without referencing to any ground marker points. The second-tier points are set up by using total stations with reference to the first-tier points, consisting of narrow network with the interval of about 50m.

In this study, we examine the practical performances of double-frequency GNSS receivers and estimate uncertainties of baselines measurement for the variety of ranges from 200m to 18km. We also examine the practical performances of total stations that are used most in public surveys and estimate uncertainties of angle and distance measurements in a short range of about 50m. During this study, we find that the centering errors of a total station and mirrors, even if they are smaller than 1mm, affect much on the positional uncertainties in traverse surveys with short distances such as 50m. This can be applied to the measurements of local ties between space geodetic instruments/apparatus such as GNSS, SLR, and VLBI.

Using estimated uncertainties of survey instruments, we can have the prospect that the positional uncertainties of the proposed control points be less than 20mm. It is equivalent to the positional

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uncertainties of 20mm of CORS at the reference epoch.

This leads to the prospect of conducting surveys with smaller uncertainties in a simplified manner compared to conventional control surveys.

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