



# Control Survey Guidelines

## What are they?

These are guidelines for the establishment and recover of project survey control. These guidelines cover both primary control points and secondary control points.

## Why is it important?

Survey control points are the foundation for all remaining survey work on a project site. Any mistakes or blunders in our survey control will be reflected in all other layers of survey and design data we create or collect for a project and will ultimately taint the final work product we deliver to our clients and partners. It is critical that our survey control is established using good methods, that our control points are durable and practically located, and that their location, character and method of establishment are well documented. Sloppiness in any part of the survey control process is not acceptable.

## Definitions

*Primary control points* are the main control points established for a project and are typically shown on documents provided to clients or partners outside of our company. For example: The control points shown on a survey control sheet in a set of construction plans/improvement plans. Primary control points should be established using Static GNSS or an adjusted total station network. Leveling may be required to determine accurate elevations.

*Secondary control points* are working points set by the field crew to survey all areas of the project site. They are not typically shown on documents provided to clients or partners outside of our company and are for internal use. With the Project Surveyor's Approval, secondary control points might be established using RTK/RTN GNSS methods or with an unadjusted/non-networked total station survey.

## Roles and Responsibilities

The *Project Surveyor* is responsible to maintain the following for each project:

- 1) A sufficient number of primary and secondary control points in good condition and with good coordinate values to allow field work to take place on short notice.
- 2) Good documentation on the location and character of existing control points.
- 3) Up-to-date control coordinate values in all working (not-archived) TBC projects, drawings, and point files.



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The Project Surveyor is also responsible to communicate the survey control requirements to the survey party chief and to assist in determining the location and survey method for control points.

The *Survey Field Crew Party Chief* is responsible for following tasks:

- 1) To use the proper methods to set new control points.
- 2) To set durable control points in a practical location.
- 3) To take good field notes on control that is set and recovered.
- 4) To communicate changes in project control or problems with existing project control to the Project Surveyor.

The *Assistant Surveyor* is responsible for assisting the project surveyor with his tasks related to project survey control.

The *Field Survey Coordinator* or *Project Surveyor* is responsible to review raw data files and ensure these guidelines are being followed by the survey field crews.

## Schedule

A plan for survey control should be created and discussed with the field crew before the field survey takes place. Information on survey control methods and location should be included in the topo survey plan, boundary survey plan or other parts of the field package as appropriate.

Raw data files and field notes should be reviewed for new survey control points and notes on existing control points after EACH field survey.

## Field Notes

For every new control point established on a survey, 2 field note forms should be included. One is the Survey Control Monument form. The other is one of the following forms:

- Control By Total Station Form.
- Static GNSS Observation Log Form.

Checks to existing control should be properly documented in the field notes for RTK topo surveys and total station topographic surveys.



## Check The Equipment:

Before setting new control points or validating existing control points, the field crew should check their equipment. This includes the following tasks:

- Check the bubbles on your rod, instruments, and tribrachs.
- Make sure rod tips are secure and not rounded from wear.
- Make sure your data collector or survey instrument is using the appropriate combined scale factor, unit system, coordinate system/zone, and prism offset.
- Make sure you are using the fine measure mode on your total station EDM.
- Make sure you are using the appropriate epoch date interval and observation length for RTN, RTK or fast static GNSS observations.

## Search for and recover existing control:

- Make sure the existing control is in good condition.
- Make sure the description of the existing control points matches what you are actually seeing on the ground.
- Apply fresh paint, flagging, guard stakes and lath as appropriate.

## Setting new control:

- 1) *Plan ahead.* The *Project Surveyor* should have provided a sketch or exhibit showing the desired location for primary control. Walk the site. Investigate the proposed locations of the primary control points. Consider locations for the secondary control points you will need to complete your work. Place control points where they won't be disturbed by construction or other activities whenever practical.
- 2) *Consider point visibility.* Remember line-of-sight for total station surveys. Consider GPS obstructions and site features that will cause multi-path problems.
- 3) *Consider site access and security.* What will access to the control point be like in wet weather conditions, at a different time of day, or in a different season? How secure is the location? If an instrument or backsight is left at the control point, is it visible from other parts of the work area.
- 4) *Consider the monument type.* Set durable and permanent monuments for primary control points whenever practical. This means a monument made of metal, not of wood. Chiseled marks are also acceptable in urban areas. Secondary monuments should also be permanent



whenever practical. There is no such thing as a temporary work point. Don't use regular topo shots as survey control.

- 5) *Consider the method of survey.* If you are setting control with a total station make sure your EDM is in fine mode. Double-check your rod heights and your instrument heights. Use the traverse method or survey with direct/reverse side shots. As an alternative, you can survey a control point from more than one total station set-up. *Unless there are special circumstances, don't use the resection method to set new control points with your total station.* Fast static GNSS observations should be taken with 2 meter fixed height tripods or rods. Complete observation logs.
- 6) *Use the appropriate point numbers.* Pay attention to your point number series. If you replace a control point, don't survey it using the same point number.
- 7) *Update the Project Surveyor to changes in control.* Whenever a control point is damaged, disturbed or destroyed mark it in your field notes and inform the Project Surveyor.
- 8) *Minimum Requirements for Site Control.* Before you leave a site there should be at least four (4) control points with horizontal and vertical coordinates. Unless told otherwise by the Field Coordinator or Project Surveyor, run the level between your primary control points.
- 9) *Don't use GNSS elevations for control.* RTK GNSS and RTN GNSS elevations shouldn't be used for survey control. Fast static GNSS elevations may be used for control on certain projects (such as long linear surveys). This should be cleared with the Field Coordinator or Project Surveyor.
- 10) *Take good notes on your primary and secondary survey control.* Your notes should include the type of monument set, the method used to set the monument, and a sketch showing the location of the monument.
- 11) *One primary control point should be selected as the site benchmark.* An excellent description of this control point should be included in the field notes. This control point should be placed in a location that is the most likely to avoid destruction.

Note: You may be occasionally asked to set control using a total station with assumed coordinates and static GNSS ties with Opus X90 GNSS receivers. (This usually happens on a job site without existing control when the RTN isn't available.) The fast static GNSS ties made with the Opus X90 receivers allow the assumed coordinates from the total station survey to be placed on real world coordinates. There is a



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specific workflow to follow for this method of control surveying. This workflow is described in a separate part of the field surveyor manual.