Construction Surveys

Construction surveying can be defined as the layout or staking of a series of reference points or markers that will assist the earthworks or construction crew in building the project according to the design. The following document will provide a brief description of the various components of construction surveying followed by a list of best practices that will assist members in successfully completing these types of surveys and avoid insurance claims.

Common causes of Insurance Claims from Construction Surveys:

- improper checking procedures,
- insufficient research,
- inadequate communication,
- transposition of numbers, not caught by closing to a second benchmark or closing a traverse

Construction surveying encompasses numerous types of surveying including but not limited to the following:

1. Topographic Surveys
2. Control Surveys
3. Grade Staking & Layout Surveys
4. As-built & Volume Surveys

1. Topographic Survey

Prior to construction, a preliminary topographic survey of the proposed site is typically undertaken. This data is used as a basis for creating the design for the project. This design should be provided to a surveyor in the form of “Issued For Construction” (IFC) drawings prior to any of the following construction survey types being undertaken. See the best practices document relating to topographic surveys for further details.

2. Control Surveys

Prior to undertaking a control survey the following must be obtained: design accuracy specification and tolerances for the project, and the scope of work for the project. The accuracy requirements for a project should be included in the “Issued For Construction” (IFC) drawings or the contract for construction. Based on the accuracy requirements and scope of work provided,

a survey methodology can be created that will provide the required accuracy. See the best practices document relating to GNSS surveys for further details.

If survey control information has been provided by a third party, an independent control survey should be performed by the surveyor to verify the control data meets the stated project requirements and accuracies in the IFC drawings prior to commencement of any site layout.

3. Grade Staking & Layout Surveys

Prior to performing stakeout or layout surveys the IFC drawings should be reviewed and any discrepancies or ambiguities clarified prior to proceeding with site layout. No assumptions should be made as to any position on the plans. The layout should be pre-computed and sufficient redundant checks performed to ensure the layout data is consistent with the construction drawings. Digital files of the drawings must be checked against the IFC drawings prior to use.

If survey control information has been provided by a third party, an independent control survey should be performed by the surveyor to verify the control data meets the stated project requirements and accuracies in the IFC drawings prior to commencement of any site layout.

4. As-Built & Volume Surveys

As-built surveys are performed after part and/or all construction has been completed on a project such as roads, railroads, airports, bridges, structures, dams, and underground facilities. Measurements are obtained with respect to the site control to verify the location of the completed parts of the structure and or determine the volume of work completed. Typically, these locations are compiled and reference back to the design position to confirm that the structure has been constructed to the tolerances stated in the IFC drawings.

When a Real Property Report is required see the best practices document relating to Real Property Reports surveys for further details.

Best Practices

1) Safety - Ensure that survey crew members can work safely on site and that they are aware of any ongoing construction activity, such as earthworks or the installation of services that will affect your work.

2) Checks – Check and recheck your work. Lack of independent checks whether it be in field layouts or calculations are the most common causes of insurance claims in construction surveys.
3) Communication – Do not assume anything, if there is ambiguity in instructions or drawings, request clarification before proceeding. Confirm all verbal communications with an email to all of the pertinent parties.
4) Scope of Work – Do not undertake work that was not scheduled or approved for layout, without proper preparation and direction, , i.e. don't let the site superintendent redirect a crew's activity to do extras that were not planned or approved.
5) Ground Disturbance – Prior to construction, verify who is responsible for locating underground facilities in the work area.
6) Revisions – In the event that changes are required to design for any reason, obtain authorization in writing by an authorized person (i.e. site superintendent, project manager etc.)
7) Do not be overly influenced by unreasonable client demands.
8) Certification-ACLS recommends that all products prepared by a CLS be signed and certified as such

References

The Three C's of Construction Layout (not just Check, Check, Check) *The Ontario Land Surveyor* magazine*, Winter 2005, submitted on behalf of the Insurance Advisory Committee by Paul Gregoire, OLS, CLS*

Surveying Theory and Practice Seventh Edition, James M. Anderson & Edward M Mikhail, WCB McGraw-Hill