ANGLE and LINE

A Quarterly Newsletter by COWAN ASSOCIATES, INC.
Engineers • Designers • Surveyors
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SURVEYORS - WHAT ARE THEY AND WHY YOU MAY NEED THEM

By Todd R. Myers, PLS

Historically, surveying can be traced back to the early Egyptians and Greeks. As early as 1400 B.C., the Egyptians first used surveying techniques to accurately divide land into plots for the purpose of taxation. As early as 120 B.C., the Greeks developed the science of geometry and used it for precise land division. The Greeks developed what has been referred to as the first piece of surveying equipment, the Diopter (an instrument for measuring angles), and also developed the first standardized procedures for conducting surveys. As civilization has expanded, the surveying profession has kept pace with the need of society to accurately delineate and map the land and its improvements.

The early days of surveying in America really started to advance technologically in the 1800's with the event of the Industrial Revolution. The importance of exact boundaries and the demand for public improvements brought surveying into a prominent position. More accurate instruments were developed and the science of geodetic and plane surveying was also developed. Whether the project is the layout of a new road; establishing boundaries of public and private lands; developing the database for natural resource management; gathering engineering data for bridge construction, road improvements, building location or land development; the Professional Land Surveyor is called upon to perform his or her unique role, knowing that in the future, homeowners and landowners may rely on the quality of work provided.

Surveying has been traditionally defined as the science and art of determining the relative positions of points above, on, or beneath the surface of the earth; the measurement of dimensional relationships, as of horizontal distances, elevations, directions, and angles on the earth's surface.

You will require the services of a Professional Land Surveyor at some time in your life. Typically the need arises when you buy a home, land, or add improvements to your land. Since these transactions represent large and important investments, the goal of this article is to allow the reader to understand the duties of the Professional Land Surveyor.

In the Commonwealth of Pennsylvania, an individual may only practice land surveying if he is licensed and registered as a Professional Land Surveyor under the Professional Engineers Registration Law, Act 367, as amended, unless exempt under other provisions of the Act.

In the writer's opinion, the following instances are when a survey is advisable:

Before title in land is transferred.

Before land is subdivided.

Before land is developed by construction or other improvements (e.g. fence).

Before an easement or right-of-way is created across the land.

To avoid a boundary dispute with an adjoining property owner.

Before trees and/or timber are removed from a property.

Types of surveys that can be provided by a Professional Land Surveyor:

BOUNDARY SURVEY: A survey for the purpose of establishing or re-establishing the corners and boundary lines of a parcel of land. Furthermore, a boundary survey may be an original survey or a boundary retracement survey. In today's mindset, any subdivision of an existing tract of land is considered an original survey. But, before a parcel can be subdivided, a boundary retracement survey must be performed to locate corners and boundary lines. A retracement survey is a

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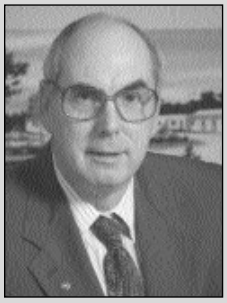
PRESIDENT'S CORNER



Change in Leadership

Richard Cowan, who founded the firm in 1958, believed that Cowan Associates, Inc. should be a civil engineering consulting firm providing civil engineering services to the public and private sector. James Leister, his successor, believed that the name "Cowan" should be synonymous and recognizable as a firm that provides quality work, and the firm should be continuous and constant. To accomplish this, they adopted a policy of hiring bright people, training them and, after a suitable period of character study, professional training and ethical behavior, making them part of the management team.

Last year, in recognition of their quality work and tireless efforts, CAI took another step in firm continuity and rejuvenation of management by asking Charles R. Tomko, P.E. and Scott P. McMackin, P.E., to join Johann F. Szautner, P.E., PLS, Todd R. Myers, PLS, and me in firm ownership.

CAI is now ready for another step. In March 2005, I will have served CAI for 32 years, these last 6 years as President. At our last Board of Directors meeting, it was decided to promote me to Chairman of the Board and install Johann F. Szautner as President.

While my duties will change, my presence at CAI will not. I will be divesting myself of corporate management responsibilities, assisting Angelika B. Forndran, P.E., our new Director of Environmental Engineering, spending more time in project engineering design and quality control, and mentoring of CAI employees.

Another step, another landmark meant to insure commitment to the ideals of former leaders Messrs. Cowan and Leister for the continuation of our firm for you, our friends and clients.

Have a GREAT NEW YEAR.

SURVEYORS

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boundary survey that re-establishes the corners and boundaries of a parcel of land previously surveyed.

LAND TITLE SURVEY: This is a boundary retracement survey with additional survey detail to meet the specifications of the title insurance company, as qualified by the lending institution.

TOPOGRAPHIC SURVEY: A survey showing the contours of land and locating natural and manmade features above and below ground, as contractually agreed upon between the Professional Land Surveyor and Client.

CONSTRUCTION SURVEY: The horizontal and vertical control and alignment which facilitates the construction of public, private, and utility improvements to a tract of land.

FLOOD ELEVATION CERTIFICATE SURVEY: Federal Emergency Management Agency National Flood Insurance Program for properties and buildings which lie within a potential flood hazard area, require a certified survey.

The two major methods of surveying are (a) Three dimensional Geodetic Survey which takes into account the theoretical shape of the earth and covers large areas of land; and (b) Two dimensional Plane Surveying which assumes that the survey area is a flat plane, generally covers small areas, and is the most common surveying method.

Cost of a Land Survey: The cost of a land survey depends on many factors which need to be fully understood by the client. Variables which could possibly affect the cost of a survey are:

Purpose of survey and related accuracy specifications.

Courthouse land title research and the complexity of record research.

Size of the parcel of land to be surveyed.

Terrain and accessibility to site.

Environmental factors such as time of year, foliage, deep snow.

Title insurance company's requirements.

Survey monumentation, i.e. concrete monuments versus iron pins set as property corners.

Survey plan and plat preparation requirements.

It is best to consult and contract with a Professional Land Surveyor to determine a cost for a survey. With the different possible requirements, a survey which meets both the client's needs as well as the legal standards, based upon proper research, field, and office work, will prove to be the least expensive survey in the end.

Selecting a surveyor: Only a Licensed Professional Land Surveyor may perform boundary or land title surveys in the Commonwealth of Pennsylvania. A Professional Land Surveyor who practices under the Code of Ethics is a credit to his community, his client or employees, and himself. The Professional Surveyor offers a technical and complex service. It is important that he or she be knowledgeable in whatever relationship he or she has or will develop with a client.

For a list of Professional Land Surveyors active in your area, please consult the Executive Director of the Pennsylvania Society of Land Surveyors at 2040 Linglestown Road, Suite 200, Harrisburg, PA 17110; or simply call me at 215-536-7075, extension 131.

Design and Construction Pricing Structures

By Johann F. Szautner, P.E.

Recently one of our clients was ready to finally realize his dream and build a facility expansion that we engineered, and for which we received the required governmental permits. Having selected a contractor, he was faced with the challenge of deciding how his contract should be structured. After I discussed with him the various options, its risks and benefits, I realized that maybe some of you might be in a similar situation and might find the following review useful. Design and construction services are customarily priced in a variety of ways:

Hourly: Architectural and Engineering services are often charged at a rate of so many dollars per hour of service provided. Construction costs are rarely charged at an hourly rate.

Construction methods of pricing tend to be used on particular types of projects and are driven by factors unique to those projects. Some examples are included following the description of

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Design and Construction Pricing Structures

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each contracting method.

Percent of Construction Costs: Architecture and Construction Management services are sometimes charged based on a percentage of the ultimate cost of construction.

Methods of pricing by contractors tend to be used on specific types of projects and are driven by factors unique to those projects. Here are the most common examples:

Cost-Plus: The contractor is paid for all of its costs of performance (labor, materials, equipment, management and other services) plus an additional percentage for overhead and profit.

Renovation of, maintenance of, and additions to factories and process plants. Because the owner is taking all cost risks, contractors perform the work for extremely thin overhead and profit margins.

Small repair and maintenance projects, particularly commercial and residential.

Renovation of existing structures where cost of performance may be significantly affected by conditions that cannot be seen before work begins.

Extremely risky or unusual projects for which the contractor has no basis to make a cost estimate or would have to include a large contingency.

Guaranteed Maximum Price: This is a variant on Cost-Plus. While the contractor is paid on a Cost-Plus basis, the contractor also guarantees the owner that costs will not exceed an agreed-upon maximum. Often, the contractor gets a share of cost savings (difference between the Guaranteed Maximum and actual costs) as an incentive to control costs.

Construction of apartment and office buildings (low- and high-rise), warehouses and light industrial buildings. This work tends to be repetitive, so the risks are relatively low. For owners, this pricing structure keeps profit margins thin and encourages cost savings.

Lump Sum: The contractor agrees to perform the project for a lump sum or fixed price.

Nearly all public works projects.

Sewage treatment plants and other facilities that are project financed. (Project financing is obtaining bank loans or floating bonds to build a facility that will generate revenue. The loan is made or the bonds issued on the credit strength of the project itself, not on the owner putting together the project.) As a condition of financing such a project, lenders insist that costs be as firm as possible.

Any kind of project where pricing certainty is desired and the owner is willing to pay for it. That is, contractors necessarily add contingency to their lump sum prices. The owner pays for the contingency. In exchange for that extra payment, the contractor accepts the risk of all cost overruns – so long as the owner has not caused them by making changes or asking for extra work.

So now you have a menu of options from which to choose. The only thing missing may be a list of specific unknown problems you will encounter, a list for which Dilbert would surely ask.

I hope that the above is useful to you, and if you wish to further discuss this or have some specific Design/Construction project issues, call me at: 215.536.7075*132 or email me at jfs@cowanassociates.com.

Facts Speak Louder Than Eloquence (Chinese Proverb)

By Johann F. Szautner, P.E.
Civil and Forensic Engineer

Synopsis

On a windy morning, a patient entered a doctor's office through the building egress door. The door opened outwardly only upon applying a considerable pulling force and, after opening, closed rapidly, catching and breaking the patient's right index finger before he could withdraw his right hand with which he steadied himself on the jamb to apply the pulling force.

Forensic Investigation

Plaintiff's expert determined that the door, with its automatic closure device, closed in 2.4 seconds, which was unreasonably dangerous and exceeded building code requirements. Therefore, the commercial establishment and property owner were negligent and bore full responsibility for the plaintiff's injury.

Furthermore, correcting the hazardous door closure swing merely required replacement of the defective door closer device at a cost of less than $50.00. He then proceeded with an eloquent treatise of how the prevailing winds exacerbate the dangerous condition by pushing on the door, making it more difficult to open and, once opened, would accelerate the closing speed.

He did not document his door closure speed measurement nor wind force nor direction measurements. Investigating this accident for the defense of the medical office tenant, I made the following findings:

1. Building construction preceded the current building code requirements, establishing a 5 second minimum speed on door closers from a 90° open position to a 12° open position.
2. ADA requirements codified in 1992 require a principal egress door with closure devices to close in no less than 3 seconds from a 70° open position to a point 3 inches ahead of the closed position.
3. Our measurements showed that the door closing speed measured in accordance with ADA requirements was 2.1 seconds, exceeding the 3 second minimum limit.
4. We observed the door jamb to be slightly out of plumb and the door's top corner above the latch to bind against the jamb when engaged. Numerous scuff marks on the door, as well as on the jamb, manifest this to be an ongoing problem.
5. We measured the pull/push force necessary to swing the door to be 7.5 pounds, but twice as much to open the sticking door.
6. Wind conditions during our investigation were negligible, and I determined wind conditions to be insignificant compared to the deficiencies we found.

Conclusion

Based on my investigation, I found that I could not prepare a defensible report and I recommended quick settlement and complete door replacement, including jamb and hardware.

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The Water Supply and Wastewater Infrastructure Capitalization Program

by Angelika B. Forndran, P.E.

The Water Supply and Wastewater Infrastructure Capitalization Act was passed on November 19, 2004 as the legislators were eyeing the door for the end of the session. This Act 218 enables expenditures for water and wastewater infrastructure which the voters of the Commonwealth had approved (Water and Wastewater Treatment Project Bond Act of April 2004). Among much debate regarding its implementation were the issues of "how" and "who" would be able to spend these funds, "how much" would be eligible for loans versus grants, for older systems in need of repair in urbanized areas versus new system extensions, and the definition of the driving force "economic development." The Act is passed, the money is authorized. Here is a short summary of some terms::

Act 218 (S.1102) amends Title 12 (Commerce and Trade) and the Title 64 (Public Authorities and Quasi-public Corporations)

The Commonwealth Financing Authority is responsible for approving the grant applications and review of applications will be by the Department of Economic Development "in conjunction with" the Department of Environmental Protection.

Chapter 39, Water Supply and Wastewater Infrastructure Capitalization, is added to Title 12 to finance single year and multi-year grants to municipalities and municipal authorities; and loans to municipalities, municipal authorities, industrial development corporations, and investor-owned water and wastewater enterprises. Funding is eligible for acquisition of land and interests and projects which construct, expand or improve water and wastewater infrastructure and which are related to economic development; loans shall not exceed 2% interest and 20 year terms. A fund established at $200,000,000 shall be used by the Department.

A similar amendment is added to Chapter 64 as Section §1558.

In addition, the Commonwealth shall incur from $50,000,000 to $100,000,000 of additional debt by December 31, 2005 to be transferred to the Pennsylvania Infrastructure Investment Authority (PENNVEST) to finance projects which:

a. repair, rehabilitate or modernize existing water or wastewater systems to meet environmental or public health standards.

b. eliminate existing combined or sanitary wastewater overflow problems.

c. construct water or wastewater infrastructure to improve public health or eliminate environmental concerns.

d. construct wastewater infrastructure utilizing nutrient reduction technology.

This is introductory information only. For further information regarding potential projects for funding, contact Angelika Forndran, PE., Director of Environmental Engineering. If you have further interest in interpretation of this act, contact your solicitor.

**ANGLE and LINE is published quarterly by Cowan Associates, Inc. For additional information on articles contained within contact:
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