



PDHonline Course P118 (8 PDH)

Construction Layout - A Foundation for Success (Part 1 of 2)

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Course Outline

Whether you're a professional engineer, land surveyor, construction layout contractor, entry-level employee working in a construction layout crew, party chief, construction manager, superintendent or architect, you'll benefit by a better understanding of this unique, essential component of any significant construction project.

By walking the reader through a typical, mid-sized project, covering bidding, contract negotiation, paperwork, interpersonal relationships, procedures, documentation, billing, site reconnaissance, geometric computations, and applying specific layout methods, the reader will not just be told about things but will see and experience the broad spectrum of construction layout and related disciplines through the eyes of its author. This approach makes remembering what's presented so much easier.

Tips (maybe even trade secrets) are freely shared - important lessons and experience learned by a surveyor licensed in 7 states, who's been an employee of developers, construction managers, architects, engineers and surveyors since 1963 and possesses a wealth of knowledge gained through founding and operating a successful construction layout business.

Neither fear nor swelling pride fosters success in this unique business. And, both attitudes are more common to providers of layout services than a quiet confidence born of real understanding. This course seeks to establish the latter.

Construction layout is a specialized, demanding function. It deserves study and the sincere respect it seldom gets. Its demands are uniquely complex and its rewards generous. This course is not merely the presentation of technique and processes (though these are included); it's an equipping, enabling source of knowledge and understanding.

This is Part 1 of 2 on Construction Layout – A Foundation for Success. The author strongly recommends that you take both parts of this course to have a complete understanding of the topic.

This course includes a multiple-choice quiz at the end, which is designed to enhance the understanding of the course materials.

Learning Objective

At the conclusion of this course, licensed engineers and surveyors, their technical and field personnel and contractors performing construction layout will have gained a better appreciation for the unique demands of construction project control and will better manage the business, procedural, technical and relationship aspects of construction layout - and, will hopefully enjoy construction layout as much as I do.

- Learn important "trade secrets" from a person who's successfully founded and operated a business specializing in construction layout and established a construction survey division of a large construction management firm.
- Learn how the professional Team creating new development functions and the place of construction layout on that Team.
- Learn tips, tricks and special pieces of equipment that help you perform your layout more quickly without compromising precision.
- Learn how to confidently ask questions when you really don't understand the plans or know exactly what you should be laying out.

- Learn what plans to believe or not to believe and how to check dimensions when staking a major building.
- Learn how to perform marketing and sales in effective ways without assuming an exaggerated self-importance or high pressure tactics.
- Learn how to level the playing field in a competitive bidding situation.
- Learn effective proposal writing concepts for construction layout.
- Learn how to structure your proposal or bid to limit layout items that might never be requested.
- Learn how to handle the correction of errors you discover in the plans and how to stake those items correctly without assuming liability for the correction.
- Learn the advantages and disadvantages of both small firms and large firms in relation to seeking clients for construction layout contracts and how to promote your strengths when seeking contracts.
- Learn the "full-service" layout requirements for a mid-sized, commercial project and how to structure these in your proposal.
- Learn how your billing relates to your proposal and what documents should accompany your monthly statements to your clients.
- Learn how to easily keep track of set-fee, proposal item billing based on percentage of completion.
- Learn tricks for transferring column lines or offsets to column lines to upper floors on multi-story buildings.
- Learn how to set control for major buildings, so that you can repeat precise layout, even after your building or column offset stakes are destroyed.
- Learn staking requirements for traditional utility construction methods and for pipe construction guided by a laser.
- Learn how to limit liability through your proposal, your contract, your correspondence, forms and private records.
- Learn the importance of receiving full sets of plans early and of attending the pre-construction meeting.
- Learn what digital files you should obtain and why you need both paper and digital plan sets - and why you need to get these early.
- Learn how the construction management firm's employees differ in experience and roles and how to handle your relationships with the persons filling each role.
- Learn why asking questions is critical to your success and know what questions to ask of whom and when.
- Learn why you and your crews must be familiar with your contract/proposal and carry a copy to the site.
- Learn why a project Field Folder must be created, what goes in it, and why it's taken to the site with each visit.
- Learn safety tips and principles unique to an active construction site.
- Learn how to make money "in the rain" (or at least maximize down-time due to weather).
- Learn what the Geometric Plan was historically, what it is today and when to believe or not to believe in the integrity of a digital drawing file.
- Learn tips for selecting the personnel who will perform construction layout and managing crews sent to perform layout.
- Learn tips for adjusting equipment on the fly - or on the job site.
- Learn suggested staking techniques and relative precision typically required for the many different features you're laying out.
- Learn standard ways to mark stakes that get the job done, avoid confusion and protect you from the potential for huge back-charges (Mark a stake improperly and you've bought the farm!).

- Learn proven techniques for preserving your primary control (traverse control points) that are needed throughout the entire project's duration.
- Learn why flagging on stakes should be color-coded.
- Learn how color-coded file folders and certain standard forms give you the upper hand when clients misremember what was said or what actually took place.
- Learn rules of thumb that are useful when performing layout.
- Learn why Conversation Logs are essential records and how they can save you from client disputes and claims against you.
- Learn why Work Orders are necessary, how to use them for work authorization and for getting paid in a timely manner.
- Learn what paper field book documentation is appropriate and what notes belong in a data collector file.
- Learn how a standard rubber stamp impression at the start of each day's notes in the paper field book will train your crew to think like business people.
- Learn how to expedite layout by copying sketches directly to field book pages.
- Learn how and when to write CYA memos, e-mails and letters.
- Learn suggested disclaimers to include in your proposals and grade sheets to minimize disputes and back-charges.
- Learn typical staking and grade sheet preparation for single family residences.
- Learn typical staking and grade sheet preparation for residential driveways.
- Learn typical pattern of layout for curbing and parking lots and what sketches are necessary to avoid confusion over your stakes and to uniquely identify each stake on your grade sheet.

Intended Audience

This course is designed for engineers, land surveyors, architects, contractors, or anyone contracting, providing, reviewing or specifying construction layout services.

Benefit to Attendees

This course teaches both technical and practical skills, contract and business considerations, staking and grade sheets, client relations, functioning in and with the design/build team, and relates countless tips and trade secrets learned only through solid, real-world experience.

Course Author

The author of this course is a Licensed Land Surveyor who's obtained professional registration in seven states and served as assistant construction superintendent, teacher, writer, civil technician, site planner, land surveying department head for mapping firms, civil/consulting firms and developers, created and managed the construction layout division of a large construction management firm, founded and operated a successful construction layout business and separate land surveying business and worked as the employee of civil, surveying, and architectural firms, developers and state government. His career began in 1963.

Such a diverse background is rare and provides a breadth of understanding beyond that normally experienced in any single profession. Construction layout is viewed from many perspectives not commonly experienced by the land surveyor.

Construction layout is like a unique and fascinating jewel having many facets, each unique and worthy of careful study. As an object of study, construction layout must be placed in its proper setting - that is, in its relevance and relationship to the design/build process and the professional team that gets things built. Understanding construction layout from this overview yields success. This is our goal.

This course provides an overview and perspective of critical value to land surveyors, but it's purposefully aimed at any person working in the disciplines listed below. It's not just for surveyors, but most surveyors should obtain a deeper and broader understanding of this challenging and rewarding discipline. The course will increase knowledge and broaden horizons of understanding.

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CONSTRUCTION LAYOUT

A FOUNDATION FOR SUCCESS

(Part 1 of 2)

Jonathan Terry, P.L.S.

Introduction to Part 1

Construction Layout Part 1 presents “Foundational Principles for Success.” It conveys knowledge that’s taken decades of experience to learn – information and principles that most who know such things won’t share freely with others. ‘Trade Secrets’ may be too strong a term for what’s conveyed in this course, but much of the information is at least of the flavor of trade secrets. Success at construction layout is not achieved through technical expertise or measuring skills alone. Construction Layout exposes the architect, engineer or surveyor to a culture different from its own – to priorities and viewpoints unique to its genre, to a team experience requiring cooperation, effort and communications quite different from most other interactions within the professional design team.

Part 1 lays the foundations for understanding the ‘world’ of construction layout. For many who serve in design and surveying professions, experiencing the construction environment is like visiting another planet. It’s a planet that has a lot to share with us, a lot to teach us. It’s a fascinating place that functions to the rhythm of a drum beat starkly different from the drone of quiet designers’ cubicles. It’s the last step between conception and reality. On the construction site, dreaming ends, theory meets the real world and anything that doesn’t work gets modified until it does.

When a design reaches the stage of construction, things get real. Construction layout is just plain fun!

But, it’s a dangerous vocation, prone to frightening levels of liability exposures. Construction layout happens on a playing-field where the blame-game is played with high stakes. Many are afraid to perform construction layout services, and they’re right to be cautious. It’s not for the faint-hearted, for timid souls or novices. There’s a lot to know besides cogo calcs and measuring skills.

This course introduces the big-picture – what you need to know to survive and even prosper performing construction layout - foundational principles for success.

The writing style – holistic and personal

Have you noticed that technical course material is often written in a rather dry way? Let me say up front that the writing style of this course is intentionally holistic and personal. The subject matter is presented as it directly relates to other disciplines, to business and ethical considerations, and to how it interfaces with other members of the professional team. The material is often supported or illustrated through actual experiences – both successes and embarrassing failures. Learning evolves rather than progresses, expands rather than stacking fact upon fact. Word-pictures unite specific technical knowledge with whole processes so that raw information is more readily retained, homogenized with other relevant facts and some practical applications.

Dictionary.com defines holistic as “emphasizing the importance of the whole and the interdependence of its parts... concerned with wholes rather than analysis or separation into parts.” The word comes from holism, “The theory that... reality is made up of organic or unified wholes that are greater than the simple sum of their parts.”

Why choose a holistic approach in creating this particular course? Because success at construction layout requires focusing on the big picture and employing intelligent, integrated, informed, sensitive approaches to layout tasks. Expert measurement skills alone are simply not adequate, though these skills are essential.

To please your clients, make money, and stay clear of those dreaded back-charges that haunt the construction layout profession, expertise in measurement must marry an informed perspective. That necessary union, in a nutshell, dictates the content of this course and frames its essential purpose.

At the end of this course, you should feel like you’ve gained not only knowledge, but more importantly, experience. The former is important; the latter is essential.

The place and function of construction layout – its importance – Some points to ponder

Many who provide construction layout services do so with timidity that betrays their terror of back charges. Deep down, no matter how skilled they are at measuring, they know they lack understanding of what they’re doing on the foreign soil of the construction site, and of how their function relates to the overall construction process.

Some brazen professionals bring a prideful overconfidence to construction layout, approaching the task just like any other, every-day, land surveying or engineering assignment – which construction layout definitely is not.

Respect it; don’t fear it.

While most surveyors and engineers consider construction layout risky (from liability potential and fee collection points of view, which it is), surprisingly few give it respect – real respect.

Often, department heads employed by large, multi-discipline firms view construction layout as a necessary evil – something that's got to be done in order for their employer to offer full services to design clients. If you've ever staked a house on the wrong lot or watched a storm sewer system being ripped out of the ground (demolition and reconstruction you're paying for because you staked it in the wrong place), you know personally that construction layout is important and critical work. In addition, it's risky. The less you know about it, the more risky it becomes.

Sometimes, construction layout is respected only because of its capacity to wield severe consequences for blunders or mistakes. However, there is a better reason to respect construction layout as a truly important service; it is *inherently* important work. By its nature, it simply is very, very important work.

It's worthy of respect as a professional activity, every bit as much as the work surveyors universally consider professional in nature – boundary surveying, for example. Sure, it's different from analyzing conflicting evidence of boundaries to render a professional opinion as to where property lines are located. Surveyors everywhere consider that activity 'professional.' Nevertheless, construction layout is a VERY professional service. The work should be treated with respect, in keeping with the self-respect you gain as a valued participant in the construction process.

Layout contractors and construction managers often understand the layout needs better than surveyors or engineers do. But, they seldom understand measurement theory and geometric computations the way most surveyors and many engineers do.

Expertise in measurement is something any worthy surveyor brings to the construction site. But a thorough understanding of how that particular skill functions at the construction site is something gained over time, and many professionals simply lack this understanding.

Whether you're a layout contractor, engineer or surveyor, if you possess both the insight into construction's unique needs and measurement experience, this becomes evident to the seasoned construction superintendent. Conversely, if you're a novice at construction layout (no matter how technically proficient you are), chances are you'll frustrate those who use your layout. Inexperience in the world of construction is noticed. And, real competence in construction layout is readily discerned and greatly appreciated.

Everyone wants to feel that his or her work is important. But, do you realize how very important construction layout really is?

I know that *you're* diligent, experienced and competent, and that you know how important your work is. So just listen in as I address your competitors for a minute. They need a word of correction to inspire them to new heights.

To your competitors, I say...

To them I ask, "Do you appreciate from the *contractor's* point of view how important your work is?" If you tell the contractor that you'll be there Wednesday morning to fill his order for staking, do you know that contractor sets in motion all manner of effort and expense based on that promise? Do you know what grief you're causing him if some other job of yours runs over due to weather or other reasons, and you don't show up Wednesday morning as promised?

If you show up on time but take two or three days to deliver a cut sheet or other documentation needed to use your layout for construction, what is the contractor to do meanwhile? If your stake labels are unclear as to what exactly is referenced, or if the excavator operator can't tell if your stake reads C=4.3' or C=9.3', you're not thought of kindly by those who stand around scratching their heads instead of constructing.

Have you ever noticed how some roadmaps are confusing to use, even though they contain the same information as other maps of the very same area? You don't like those poorly designed maps, do you? Contractors don't appreciate any sloppy, unspecific or confusing guidance, no matter how bloomin' accurate and precise the actual layout may be. Sloppy handwriting or stake labeling that makes a 2 look like a 7 or a 4 like a 9 is simply inexcusable. Sketches that are not immediately instructive are deficient. Sheets without unique and useful titles are difficult to discern and use in the field or to locate in the mountain of paperwork in a superintendent's field office.

Contractors don't like waiting around while some soul bound on precision resets a tack in a hub for the second or third time to get it just right, when that control is for blasting the route of a new sewer line. They know such a person is lost in pointless details and is missing the essence of what they're there for. Contractors find it frustrating when they can't figure out if the stake is offset from the face of curb or back of curb or whether the cut is from the top of the guard stake or the top of the hub or the ground at the stake.

My survey career began in 1963, and what hair I have left is gray. May I use the excuse of age and experience to speak bluntly to engineers and to my fellow surveyors, (not you, but your inept competitors)? Most surveyors and engineers don't know what they need to know about construction layout. Worse yet, they don't know that they don't know.

Now, don't feel insulted. The construction site is not a place for fragile egos. I'll be gentler with you than most construction superintendents and a darn sight more patient than his sub-contractors. Nevertheless, there are some things we professionals need to hear about this peculiar and fascinating line of work. And it requires a measure of humility to learn them and even more humility to practice them.

OK. While your competitor licks his wounds, let's move on.

Your competitor really needed to hear that. You and I already knew it. But, now that your competitors do too, we need to work even harder to play our part on the team.

Consider *Figure 1*.

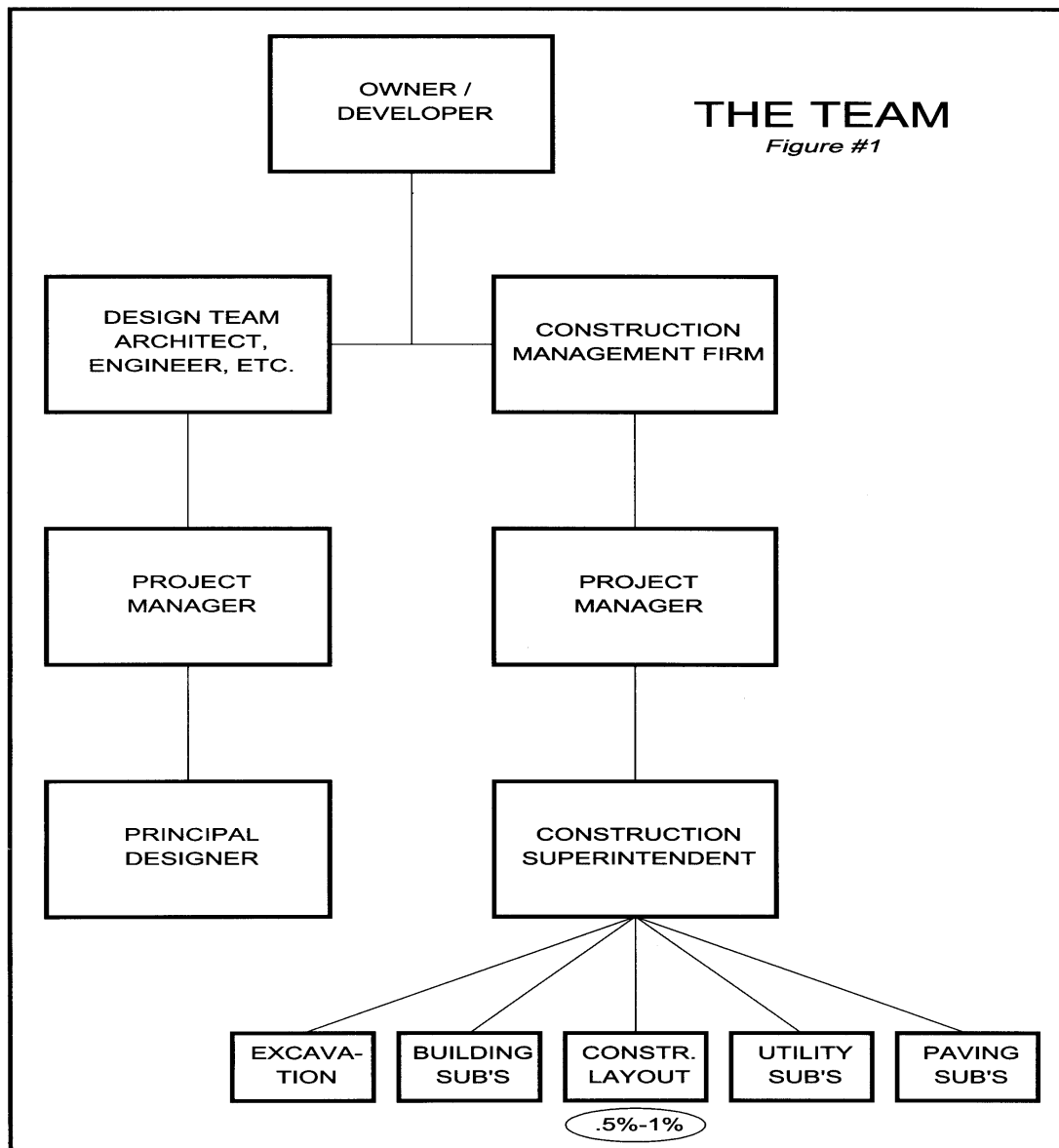


Figure 1

Humility = Knowing Your Place on the Team

You are part of a team – a multi-talented, diverse group of designers and experts who bring various, professional talents to the project. The different disciplines may include lawyers, architects, engineers, landscape architects, surveyors, environmental consultants, wetland and soil scientists, cultural resources experts, permitting consultants and more.

Most of these disciplines work independently but coordinate their activities at points where their talents meet those of others and where their designs or their specific expertise merge or overlap with others serving the owner/developer on the project.

At the point where their work is completed and approved by all the various regulatory boards and review agencies, the project goes out to bid and construction begins. This is where the construction layout specialist enters the picture. But, the roles of the professional design team members do not entirely cease at this point.

Those who perform construction layout are one part of a team. Generally, the team is comprised of the participants depicted in Figure 1. The illustration is a purposeful over-simplification. It could be expanded to include different layers of management and disciplines on very large projects or even condensed considerably for small projects like residential subdivisions and individual lot development where many roles may be assumed by a design-builder or other talented person who wears many hats. But, the basic roles and functions typical to all construction projects are illustrated in *Figure 1*.

The Head of the Team – the Owner

The obvious “head” of the team throughout design and construction phases is the owner/developer. This person or business entity foots the bill ultimately. Generally, as a construction layout contractor (whether you’re a surveyor, an engineer, a non-profession layout specialist or a subcontractor providing your own layout for what you’re constructing), you won’t have direct contact with the owner or developer.

Each of the owner/developer’s selected design consultants generally has an in-house design group consisting of a project manager or principle designer plus that person’s design team. This is depicted along the left side of *Figure 1*.

The illustration stops at the **Principal Designer** for a very special reason. It’s because **this is the person you will most likely contact when plans need clarification or correction**. More on this later. This person is the hands-on leader of a design team – the person actually acquainted with specifics of the design you lay out.

On the right side, is the team that gets the project constructed. On all but small projects, a construction management firm or general contractor selects, hires and oversees a number of subcontractors, of which you are most likely one.

Construction Management Firm

For typical, mid-sized commercial projects with construction costs of several million dollars, a construction management firm assigns a **Project Manager** to oversee the project’s construction. Often this person is not actually present on the construction site but handles the administrative, contractual, scheduling and financial matters. This Project Manager generally has direct and frequent contact with the owner/developer. Often, this Project Manager has an assistant whose time is spent part-time in the office and part-time at the job site. One of these persons will choreograph the sequence of construction and determine what has to happen before another thing can take place and what things can take place simultaneously without conflicting with each other. Theirs is a big and an important job.

The **Construction Superintendent** is the construction management firm’s on site manager coordinating the efforts of many subcontractors represented along the bottom of *Figure 1*. These people along the bottom row, in my opinion, are heroes. Their work is physically demanding,

complex, and sometimes dangerous. Their profit margins are minimal, and they will pay for any mistakes they make in cold, hard cash. They are the worker bees, the ants carrying burdens many times their own weight. That's you. (And me.) There we are on the bottom, right where we belong. Unsung heroes, conquering and redefining the frontiers of civilization.

Soon we'll be forgotten. Our names won't be found on bronze plaques and generally not even on the temporary construction fence. Speaking of the construction fence, may I digress to suggest that you ask the construction manager or general contractor if you may place a small sign on that fence? "CONSTRUCTION LAYOUT BY [YOUR FIRM]." Providers of construction layout seldom seek this advertising opportunity. Many times, permission is granted. It's worth a shot. Remember, other construction people driving by that site hire people like you, and they always glance over to see what's happening on other construction sites. And, look. There's your sign!

So who's the little guy?

OK, so the point is, *you're* the little guy. By the way, women have appeared on the construction site, so 'little guy' is genderless in my usage. Whether male or female, you're the little guy – one servant among many who actually do the work the others above you in rank and responsibility oversee and benefit from, probably a great deal more than you do. You're an unsung hero in the company of other unsung heroes at the low end of the food chain. Ain't it great?

Actually, it *is* great, and this course hopes to convince you that you're performing a truly noble task as a servant. Take for example, Jesus. He claimed He was the Son of God, yet He said, "I came to serve, not to be served." Catch a vision for the glory of being a servant and you'll have a happier life. (This is a great mystery.)

On being a "Team Player"

The term "team player" has come to mean many things – from being a mindless slave to your superior's whims to actually functioning as an important member of a diverse, coordinated group of capable workers who respect and compliment one another's disciplines and specific expertise. In this course, I refer only to the latter definition. This course strives to make you an even better member of that dynamic team than you presently are.

This section is, for just a little while, unashamedly preachy. But, remember this: Any good preacher does you a favor, like the guy driving toward you and flashing his headlights to warn that you're approaching a police speed trap. Bear with me if you can, and consider these words of instruction. I'm not pointing my finger at you; just flashing my headlights. And very, very soon, I'll move on to less challenging topics.

A while back, I witnessed a party chief arguing with a construction superintendent about what points he would stake for a new commercial building. This party chief failed to recognize the limitations of his expertise and to humbly take direction from a person far more skilled in knowing what was needed. He also failed to recognize that the contractor was his boss's boss! This party chief came to the site equipped only to stake some points calculated for him back in the office. And these, by gum, he intended to stake! The superintendent walked back to his office trailer shaking his head and mumbling to himself. It's a very common tale.

On being “Presumptuous”

Too often, layout set up in the office is based on PRESUMPTION. The office person who took the order for the layout and dispatched the survey party didn't ask specifically what layout was needed and therefore didn't know what the user of the layout really wanted or needed.

The policy in that surveying firm (whose party chief argued with the superintendent) was to compute in the office the angles and distances for radial stake out. The instructions to the party chief were to perform little or no computations in the field, even though his data collector was uploaded with the project's coordinates, and he was capable of doing so. So, when that party chief arrived on site, the superintendent directed him to stake something that hadn't been prepared in the office. The party chief argued against the super's wishes and needs, and in doing so felt he was following his bosses express directions. This happens more often than you'd think. Many a supervising surveyor has been heard to say, “I don't want my party chief to think too much in the field.”

While I truly understand the logic of such a view, I suggest that the surveyor who feels this way about his party chief should not be performing construction layout services at all. It's unethical for a surveyor to perform services for which he or she is not competent or to send incompetent people to render professional services. The construction site is not static. It is ever changing, dynamic, fast-paced and unpredictable. A capable construction layout person must compute in the field and flex with the need. Of course, original work computed in the field must be checked back in the office, but to think that all work can be prepared (emphasis on *pre-*) in the office is simply unrealistic.

Often, when preparing stake-out in the office, the office person presumes to know on which side of a storm line the offset stakes will be set or how far to place offset stakes from sewer lines or building corners, or which column lines should or should not be staked – all without asking the end-user what is needed. The result? The crew arrives on site prepared for a particular approach when that is not what's wanted or needed. This is not being a team player.

Always, always ask what is desired when the call comes for layout, and prepare the crew for the unexpected. The crew should be able to flex in the field, placing the layout control where it's needed. Even in our time, when data collectors can be easily uploaded with the project coordinates, many survey crews arrive on site with sheets of paper assuming certain control points are in existence and intervisible. Such brave and vain assumptions for the active and ever-changing construction site!

On being “A Servant”

The surveyor (or anyone performing construction layout services) is there to SERVE. In our culture, being a servant is often looked down upon. This is nothing short of tragic!

It is an honor to serve others, and this is the proper attitude for the surveyor, engineer or layout contractor who sets foot on the construction site. Try to catch the vision of the glory of being a servant – of serving from the heart. Forget putting on professional airs. Look at *Figure 1*.

You're among the heroes at the bottom of the flow-chart. Eliminate the bottom row and all that construction is reduced to dreams and thoughts and lines on paper. You have specific expertise

and serve an essential function – and you do this from your place at the bottom. It's a great place to be.

Providing layout control is a critical function and an important one. But, the role is a small one when viewed from the perspective of the entire project's cost. On most mid-sized commercial projects, the total fees generated for complete construction layout services range from one half of one percent to one percent (1/2% to 1%) of the construction costs. For some projects, it's even less than 1/2%. And remember, we're assuming full-service site layout is required.

For a project costing \$5 million, the complete layout services (recon & preparation, clearing limits, rough grade control, blasting, storm, sanitary, water, curbing/paving and the primary building control and column layout, some restaking and maybe even the foundation survey and final asbuilt survey) may generate layout fees under \$25,000.

If the general contractor or individual subcontractors provide layout for some of their construction, your layout fees can be even less. Most building constructors have the expertise to lay out their entire building from corner offsets or column line staking. Because those actually constructing complex buildings normally have their own layout people who work off the primary control you provide, sites with multi-story buildings often generate layout fees well under 1/2% of the total construction costs.

The point to remember, from the financial standpoint, is simply this: you are one of the little guys.

Those who perform construction layout provide a vital need, serving along with numerous other disciplines, each requiring expertise and experience to complete the project successfully. Construction layout services play an important role, but a relatively small one, considering the scope of the average project. Others on the site usually know more than about what they want, what they need, where they need it and why than you do as the layout contractor. Be prepared to listen and give them what they want.

Mercy – you may need it.

The bible admonishes, "Consider others better than yourself." Wise words in any circumstance and admittedly contrary to human nature – but, precious counsel for those serving on a construction site. Be quick to hear and slow to speak. Don't try to impress; just serve faithfully. This is what your client needs and wants. Believe me, you will be appreciated if you serve with this attitude and do your work competently.

When you make a mistake in your construction layout, and you will, it can be very costly to you. The confident yet humble person is likely to receive some measure of mercy when that frightful moment comes that an error in your layout is discovered. If you've been proud, boastful, and arrogant and otherwise impressed others with your high view of yourself, your client may delight in humbling you when your moment of truth comes. When you've made a mistake in construction layout, you need a compassionate client. Cultivate one.

Remember, it's hard to get mad at a humble person. Some wise person advised, "Keep your words soft and tender. You may have to eat them!"

Team Recognition

OK, surveyors, we are THE experts in measurement. (I must address my fellow surveyors for a minute.) That's one thing we can be proud of, by gosh! Even here though, don't get proud. I've learned more about construction layout from the gray-haired superintendents (before I was gray-haired myself) than in any book. These geezers, the really old ones, learned construction from the ground up, and they just may know a thing or two about measuring you never learned as a modern surveyor. If they ever offer suggestions – and most will be exceedingly tactful to see if you'd be interested in the easy way or if you'd rather stay proud and suffer – then listen attentively and draw them out. You are a visitor on their turf.

The plans you stake from are in authority over you. They embody both talent and authority. And, they are often dimensionally wrong. You'll often find dimensional disagreement between architectural and structural drawings, especially if the building design departs from simple rectangular patterns for its column positions. In reporting the discrepancies you discover, assume a humble, inquiring posture. Say something like, "In looking over the plan set, Mr. Architect or Mr. Structural Engineer, I find an apparent discrepancy, and I just wanted to ask you to double check me so I don't lay it out wrong."

If a dirt (excavation) contractor or operator steps over to ask, "What the heck are you staking it that way for," explain your reasons. And, ask what he thinks would be better. Most times the person returns to the equipment, glad to be escaping the encounter. But, occasionally that person, the END-USER of your stakes, really is the only person who knows what is needed. Much is learned by listening.

Give the person who approaches you with suggestions or questions space to talk. Listen well to them. It may be that you're setting building offsets right where they'll be digging the next day. If you offend this person, your stakes may be gone before they're used. Never, never take the attitude that you don't care because you'll be paid hourly fees to restake if the control gets destroyed. Almost never will it be a waste of time to pause in your work to listen to someone trying to tell you something.

If the excavator or any other subcontractor suggests some layout other than what you've been instructed to do, and you think it's actually a better idea, go to the superintendent and ask if perhaps you should do what the other subcontractor suggested.

There are never, never too many eyes, ears and minds on a construction site. As a surveyor, did you ever have a hunch or intuition about where to find the iron pipe marking a corner? How do you explain that? You've developed a sixth sense of some kind, and instinct peculiar to your profession and your years of experience. Your fellow team members who spend all their days on the construction site have developed their sixth-sense about things, too. Listen to them. Give them room to express themselves. Seldom will you conclude time spent listening on a construction site or at a kick-off meeting has been a waste.

Requests from people other than your client

Sometimes, other subcontractors come up to you on the site and ask you to perform some layout or checking or measuring service for them. Here's a tip on how to handle this.

Decades ago I did wedding photography to support my photography hobby. Often guests at the reception would want me to take their picture, and often they were drunk. Drunks can be unreasonable if refused. My strategy was to say, “Sure, I’d be happy to take your picture, but today I’m the employee of the bride. I’m hired by her to take the photos she wants, and she’s my boss. Just have her ask me to take your picture, and I’ll be happy to come right over and do it.”

That was always the last I’d hear of it.

On the construction site, if approached by another subcontractor for some favor or work request, I say, “Sure, but the superintendent is my boss. Just have him ask me to do it for you while I’m here, and I’ll be happy to do it.”

In some cases, I really do want to do the thing I’m being asked to do. Even then, it’s good to remember that I’m there as the servant of my client. Some small favor that doesn’t compromise my primary mission, done for another subcontractor at some convenient break in my work creates no problem. But, if it’s going to take much time, someone has to pay for it. If my client sees me doing something my client has not assigned or authorized, he or she may wonder if I’ve misunderstood the instructions or if I’m going to charge my client for the activity. It’s always important to keep the client informed and in control.

Some contractors want more than a little thing done, and they’re willing to pay for it, “if I can just do it while I’m there.” I’ll only do it if I’m certain I can complete my main client’s assignment in the time allotted. And, I’ll tell the superintendent what I’m doing for someone else on the site so there’s no confusion. Before starting work requested by another subcontractor, I’ll write it up on a work order noting the estimated fee and get the signature of the one requesting the work. More than once, that person has balked at signing the work order, and I simply tell them I can’t start the work without a signature to authorize the charge. (If they won’t sign a work order, do I really think I’ll get paid?)

Work orders are discussed in depth in Part 2 in this course. For now, suffice it to say that work orders are an absolutely essential tool. You’ve gotta have ‘em!

The Essential Principle – What is Construction Layout?

Construction layout is the discipline of surveying in reverse, that is, the skills and measurement expertise of surveying applied in a reverse flow of information.

Surveying in general is comprised of gathering measurement data – of determining that a house or curb or other physical feature is located at a certain angle and distance from the measuring instrument, and is at a specific elevation.

Construction layout says, build that house or curb at a certain angle and distance from the measuring instrument, at a specific elevation.

Construction layout is a process that’s the reverse from that most common to surveyors. Surveyors typically set property corners, and this is a good example of what I mean by the reverse process. But, construction layout at its best requires specific knowledge and judgments

not gained in a lifetime spent locating evidence of boundaries and setting corners. Construction layout is complex, challenging and rewarding. As a professional service, it should not to be taken lightly.

Can just any surveyor or engineer provide construction layout services? Those who know very little about construction layout yet lots about land surveying and/or measuring can and do provide construction layout services. But, those few who possess expertise in construction layout stand out to the trained eyes and instincts of the site superintendent and other contractors. Such expertise does not come overnight, but through patience, attentiveness and conscious effort. Be certain of this: your client knows whether this expertise resides with you or not.

This course will shorten the time required to obtain expertise in construction layout. Some things, only personal experience teaches. To the best of my ability, the course teaches what another's experience *can* teach, so you gain personal experience as rapidly as possible.

Who should provide construction layout – large firms or small firms?

Some small firms, really small – say two person firms – will feel they are too small to provide construction layout services. Some department managers of large firms will feel construction layout is too risky to perform and fear their advanced planning will be upset with sudden requests for layout. This section attempts to provide a broad-brush view of both large and small firms' advantages and disadvantages when it comes to providing construction layout services.

Large Firm Advantage – Service Considerations

Staffing Flexibility

Larger firms having multiple survey crews in the field at any given time can often drop a large, ongoing project for a day or two in order to meet the needs of a construction layout request. Even a couple or three calls for layout coming in rapid succession may not overwhelm the larger firm. The small firm can sometimes receive multiple requests for urgent layout and may not be able to satisfy all clients at once. In this matter, large firms have a distinct advantage – if they use it.

Full Service Marketing

Often, the construction manager will automatically call the full-service firm that designed the project for the layout of that firm's designs. The assumption is that the firm can hit the ground running and provide fast, efficient responses to layout needs. This, of course, is not always true, but it's often the imputation granted to the large firm. In a sense, the other design disciplines of the large firm have provided the sales effort necessary to make the survey department's phone ring.

Design-Build Carry Through

It may facilitate the construction manager's mission to have project's design firm also provide the construction layout. Any design errors or problems found in the course of laying out the site

will presumably be resolved quickly and without tedious and time-consuming blame-game interactions.

Final Check of Design

Some large firms consider the computations for the construction layout and the layout activity itself as a final check of their design. A new set of eyes within the firm necessarily reviews the plans one last time in the course of computing the layout – and those eyes are friendly. That is, they're the same firm's eyes, and any problems discovered will be kept as quiet as possible while a resolution is achieved. This provides significant motivation for the large firm to provide construction layout for their own designs.

Getting Paid – Eventually

Receiving payment for construction layout activities may take some time, depending on the client and the contract. Larger firms, while hoping to avoid delays in payment, are sometimes geared through necessity to better survive the slow-paying construction layout clients than a small operation living more or less hand-to-mouth. The large firm may take on a slow-paying client when other activities are in a lull, knowing it will survive the slow time and eventually recover its pace. A small entrepreneur often can't afford to service a slow-paying client when food-on-the-table is a major consideration and no line of credit exists to cover payroll or living needs. Many small business owners are not the greatest at running the business side of their venture. Their business may be excellent at its craft, but their owners not crafty at its business. The large firm that stays in business year after year has managed both adequately.

Small Firm Advantage – Marketing Considerations

Large and small firms alike provide construction layout services. Some small business owners may feel that they can't compete with larger, more diverse firms. They may not seek construction layout contracts, reasoning that larger construction management firms wouldn't consider hiring the small firm. In my experience, this simply is not true, and the construction manager probably knows better than the small firm owner does the advantages a small firm can offer.

Personal Relationship

Often, the owner of a small firm providing construction layout is present on site during all or most of the layout activities actually participating in the layout. If you are that person, it creates an opportunity to promote your company and services and to carry the air of concern for the client's needs that party chiefs of larger firms don't normally represent as well. You, as the owner of a small firm are the decision maker who can flex when the need arises. Delays due to the need to "check with the boss" are nonexistent; you are the boss.

Generally better qualified field help

If you are the business owner and are present on the site actually performing layout activities, you're generally better qualified than employees of a larger firm sent to perform those same services. Often in the small firm, a licensed surveyor who is also the business owner performs the layout. Let's face it: an employee who represents the true interests of the business owner is a

rare find. Employees who've never run a business may lack business sense and the awareness of a constant need to promote and market the firm. – Very few party chiefs of large firms make a conscious effort to show the client how valued he or she is and consistently represent the professional, mature standard that the business owner makes if physically present while performing layout services.

If the business owner is actually performing the layout, it's likely that person is qualified and equipped to compute in the field, using the full capabilities of software and less likely to make computational errors while doing so. In short, this person is empowered and capable.

I've heard more than one business owner say, "I don't want my field crews doing computations in the field." Some firms still send crews to perform construction their layout from letter-size printouts of angles and distances for radial stakeout. Such crews aren't furnished uploaded coordinates and aren't allowed to both set new control points and stake from it during the same visit to the site. While this makes sense from the layout provider's viewpoint, the policy creates delays for the construction manager.

While serving as an assistant superintendent, I've seen crews come to do layout, find control has been destroyed, set new control and leave without staking what they came to stake. The new data was brought back to the office, computed, new radial stakeout notes printed, and then the work was rescheduled and then the crew came back to the site. This never sets well with contractors or construction managers. Smaller firms, in my experience are more likely to overcome the unexpected loss of control or blocked lines of sight and deliver what they came to do in their first visit to the site. This is far more economical, but the real saving is in avoiding construction delays.

Better Communications

Often in a small firm, the person who takes the call for construction layout is the same person who'll be performing those services. The right questions are asked reducing chances of miscommunication or lack of communication. In my experience, the small firm owner with a crew or two in the field is more likely to provide cell phones to the crews or to supplement the cost of their personal cell phones than a larger firm. The small business owner seems to better understand how critical it is to communicate immediately when problems, questions, uncertainties or emergencies arise.

More Caring and Responsive

With frequent exceptions acknowledged, it may be fair to say that the small business owner is often in a position to be more flexible, more responsive and to simply care more about the contractor's needs than a large firm with huge contracts to fulfill and the need to satisfy numerous clients who provide long-term, continuing projects. In addition, the larger firms have in-house projects supplied by other disciplines within the same firm, and these often take priority over calls for layout. Performing construction layout may be viewed as a necessary evil in some large firms, whereas a small firm is more likely to view a few-thousand dollar construction layout contract as a significant business opportunity. And, it can be.

More Geared to the Task

Finally, the small firm is more likely to gear itself for the task of construction layout. Many times, the survey vehicle of the small business is better equipped for the construction layout tasks than the larger firm's vehicle. Is some supply or piece of equipment needed? The small business owner will run to the hardware store and pick up a sledgehammer, a chalk line or a can of clear lacquer. The small business owner is more likely to empower the party chief to do the same than a large firm. Many party chiefs in larger firms simply do not have purchasing authority. They need prior approval to make a purchase – and they may not be reimbursed for three or four weeks.

Morale may be better

In larger firms, the sense of division between management and labor tends, again in my experience, to be greater than in small firms. A small team is easier to build and maintain than the large one, where the lack of personal relationships between higher-ups and lower-downs breeds lack of communication and mutual respect for their differing roles. In larger firms, solutions are often sought through analysis of numbers (profits) rather than discovery and remedies of more systemic ills.

For example, in a large company where equipment-purchasing decisions are made by the bean-counters, low survey department profits may be the result of antiquated equipment, yet increased profits are demanded from the ailing department as evidence of the worthiness of further investment in that department. Catch 22.

The number crunchers of larger firms are routinely assaulted with requests for purchases from all departments, often presented with similar tones of urgency. Yet, these decision-makers lack personal familiarity with the daily workings of each department and are unable to separate true needs from desires. People who choose number-crunching careers are typically not "people persons." They're seldom seen mixing with those who actually do the on-the-boards or in-the-field work of the firm, yet their decisions impact the day in and day out work of those employees.

In a small firm, where the owner is closer in disposition and chosen discipline to the workers, it's easier for employees to present their need with a hope of being heard.

Recently, I was in a doctor's office for a series of tests. The first employee administering a test loved her job and spoke glowingly about her career. I felt at ease and rested in the assurance that this office had good people doing their jobs well. This gave me confidence in the doctor, himself. The next person to administer a test griped and complained about the lack of space to work and of the doctor's intent to hire yet another employee to share the already inadequate facility. I found myself questioning whether I'd chosen the right specialist. Then I noticed how quickly I'd gone from confidence in the doctor to questioning his capability. This change was due solely to differences in his employees' morale.

While my experience can't boast of conclusive patterns, the small firms appear to suffer less from the negative impact of disheartened employees. Exceptions noted and admitted, my experience says smaller companies have, in general, better morale. Employees with poor morale

often reveal this fact to clients and convey more about the company (true or false) than owners care to admit.

In a small company, the person or persons who benefit most from their firm's services (the owners) are closer to their employees than in large firms, and there's greater opportunity to deal with the employee whose dissatisfaction infects fellow-workers and clients on a daily basis.

Able to Negotiate Extra Work – Or to Give it Away

The owner of a small firm who actually performs the layout is able to negotiate what is or is not an extra charge when the client makes an unexpected request. Sometimes, the owner may decide to simply contribute the service that's been requested as a "favor" for the sake of relationship-building and business promotion or to build good will against the inevitable mistake the firm will eventually make. Other times the owner may say, "Well, I'll be happy to do this, but it's not in my contract. Do you see any problem in my performing this on an hourly basis as an extra fee?"

The party chief of a large firm is seldom as well acquainted with the contract as a business owner, doesn't know if the project is a rainmaker or is in the toilet budget wise. Rarely is the large firm's party chief adept at asking for extra money in some on-the-spot negotiation. Most large firms will not empower their party chiefs to assume this role, and for good reason. In this respect, my vote again goes to the small firm.

Unfair to large firms?

Perhaps you've noticed that I believe the small firm is actually better positioned to perform construction layout services than large firms.

Some may take offence at my belief about small firms having an advantage over large firms. I speak only from my own experience as one who entered my first surveying employment in 1963. I've worked in very large corporations having hundreds of employees, medium-sized firms and one-crew firms. And I've run my own small businesses, one of which served construction needs exclusively.

Admittedly, some large firms perform better at construction layout than some small firms do. Whether the large firm or the small firm does better at it hinges on who runs the firms, their experience, their attitude toward construction layout, their love of mud, dust and noise, their personalities and temperaments, and primarily whether they have any genuine concern for their employees and clients. It may be unfair to generalize, but my opinion is that the small firm has inherent advantages.

Have I seen it all? Certainly not. My conclusions are entirely subjective and offered for your contemplation and criticism.

Take courage, small business owners!

Why open this topic at all? Because small business owners may overlook a lucrative and interesting line of work by believing they're not up to the challenge of competing with large firms. Think again, small business owners. The most money I've ever made in the past 40+ years has been as the owner of a small firm specializing in construction layout. I was in the right place at the right time and had some wonderful opportunities handed to me by generous and honest

people. Even so, I never could have been successful through those breaks alone. My clients selected me because of my knowledge of their needs, my responsiveness, my honest concern for their well being, my ability to get the job done the way *they* wanted it done, my fairness, firmness and flexibility (each applied appropriately and with discretion) and the careful and thorough approach I took when serving their projects.

Am I bragging? Well, of course. But, beyond that, I'm encouraging you as the reader, whether you're working in a large or a small firm, to serve your clients (or your employer) from the heart, to strive for practical excellence and honor – and, if you own a small firm, don't be afraid to compete head-to-head with the large firms.

The Large Firm Advantage

Having said all that, large firms that maximize their inherent advantages are a force to be reckoned with. A well run large firm having state-of-the-art equipment, the ability to retain competent, experienced people who accommodate the training needs of our times and their employees, that reward excellence and extra effort and impart a sense of security and professionalism within their people and tend to the scheduling demands of their construction layout clients... Whew, I had to take a breath.

Such firms are a powerhouse!

Large firm or small firm, be the best and be bold!

Ask around. Talk with construction management firms. I think you'll hear from them what I've heard. Finding a large firm that's responsive can be a challenge. Finding a small firm with the equipment, expertise and reliability that construction managers require can also be a daunting task.

Be the best, whether large firm or small, and someone out there is searching for you and has been for a long, long time. It's not a matter of selling yourself. It's a matter of revealing yourself to the people who need you. And, that's what we'll talk about next.

The Marketing and Sales Effort

This section, while directly applying to firm owners seeking contracts for construction layout activities, provides insight to any employee performing construction layout services.

Why even those employees who are not involved in marketing and sales should read this section

Please, employees, don't skip over this part of the course. You'll be a much better representative of your employer if you know what goes into getting a contract and how hard your employer works for you. Many, many employees fail to appreciate what their employer goes through to get contracts that provide the employees' regular paycheck.

And, your function as an employee performing construction layout is to honor the contract between your employer and the client. This course material is relevant to you.

Sales or Marketing?

Before attempting to sell your services, doesn't it make sense to find out what services are typically needed? Why waste time trying to sell shoes to a person with no feet? Is there a need? Are you able to fill a need or to adjust your service package to fill a need? These questions must be answered before launching into any sales presentation. Keep some points in mind.

Who wears the pants?

Who wears the pants in your family? You've heard that expression, and it means essentially, "Who is the decision-maker?"

Before making a marketing effort or sales presentation, doesn't it make sense to find out who has the authority to actually contract you to provide your services? Talking to the right person is a key to the success of your sales and marketing effort.

Suppose I'm the best roofer in town. I spend an hour giving the best presentation on roofing the world has ever seen to the occupant of a home that's in desperate need of a new roof. Then, at precisely the right moment to close of the sale, I turn the contract I've been filling out as we've been speaking so it's right-side-up to my potential customer and ask for a signature, so we can schedule the job. The person says, "This sounds great, I'll pass it to my landlord."

What have I done wrong? I've been talking to a person without the authority to buy what I have to sell. The need for re-roofing is clear. I've made it known that I'm capable to do it. Someone, if not me, will surely meet that need in the near future. There are many incompetent people out there wanting the assignment. I honestly believe I can do the most for my client. The problem is, I've not been talking to my client. My potential client is the landlord, not the tenant. And, the tenant will never represent me to the landlord with the persuasiveness I could have.

My first question should have been, "Are you the owner of this home?"

In marketing and sales, it's best to keep these two activities separate in your mind, so you don't try to sell something there's no market for or spend time selling to people who aren't empowered to buy.

How do you perform these two functions effectively? Talk to people. Get them to talk about themselves. And, LISTEN.

People Love to Talk – About Themselves

Occasionally, you find people who *don't* like to talk about themselves, to tell you of their achievements and their expertise. Generally though, it isn't hard to engage people in conversation about themselves. Your client or potential client may find it refreshing that you ask about what they do and what they need rather than launching into a sales pitch for pre-packaged services.

People Like to Help People

In general, I've found that people like to help others, provided there's an end in sight to the help provided. For example most people will allow you to ask them questions aimed at benefiting you, even if it is not to their direct advantage to do so – provided they know why you are asking and how long you intend to tie them up.

Is There a Market?

If you are interested in providing construction layout services, you have to know a couple of things: first, who needs it and second, what precisely do they need?

When you've made a personal contact with someone who awards contracts for construction layout, you need to know if there's any possibility you will be considered to supply this need. You need to know if not, why not and if so, what can you do to make this happen.

Suggested Approach to Marketing

Consult the expert

Visit a construction site large enough to have a construction trailer or other construction office on site. Ask to speak with the construction superintendent.

Say something like the following: "Hi. My name is So-and-so, and I'd like to get into (or expand my services to include) construction layout, but I need some help understanding how your firm and firms like yours handle construction layout. I wonder if you'd consider allowing me to ask you some questions for about ten minutes to help me learn whether or not there's any potential for me to provide these services. I could come back if this is a bad time for you, or if you'd rather not help me, I'll understand."

You then pause and allow the other person to respond. Generally, you will get to ask your questions, if not in this meeting then at some other time when the person is available. If you are given a time to return, I suggest asking, "How do you take your coffee? I'll bring you a cup when I come back." The offer may be refused, but if you're told how the person takes his or her coffee, absolutely do bring a cup with you when you return. It's amazing how far this can take you.

This is not a chat – You're on a mission.

The person who has agreed to meet with you is a busy person with an important job to perform. Have your questions prepared and don't try to small talk yourself into this person's favor. Carry a small pad to jot notes on, but don't pull your pen out yet. Get talking first.

Your questions should include:

Do firms like yours hire sub-contracted construction layout, and if so, how extensive is the layout performed by them? If the answer is the firm that employs your interviewee does all of its own layout, then there are two avenues of investigation. First, to the other person's knowledge, is this true of all similar firms in the area? If so, why is this and is there any possibility for change?

If not, which firms are known to hire/not hire out construction layout? (Now, out comes your pad. Write down names of firms that may hire out the services you'd like to offer.) Then, ask if there is anyone in any of these firms who you might speak with. If you're given a name, write it down, ask what their function or title is in the firm.

If the firm that employs the person you're speaking with *does* hire out construction layout, ask whom you should speak to in that company about your interest in providing future services. Find out if the person you're referred to is the only person who awards contracts or if there may be others in the firm with whom you should speak. Write their names down and their titles if possible.

Ask what layout services are typically contracted out. For example, does the firm typically supplement sub-contracted layout by doing some of it themselves? Do their subcontractors provide their own layout? Who marks clearing limits, stakes for rough grade, lays out primary building control, column lines, utilities, roads, drives and parking areas?

Listen well. Make short notes. You may even want your typical questions and answers pre-written on your pad, so you only need to place check marks next to key words, "building, utilities, parking, etc."

Everywhere else in this course, clear handwriting and labeling is celebrated. On your pad, though, don't strive for this. You don't necessarily want the person you're with to read everything on your pad.

Close with something like, "That's all I can think of asking. Before I leave, is there anything at all you've thought of as we've been talking or that I've not asked that I should have?" Any tips offered here represent the person's own initiative. You can receive invaluable counsel at this point. So, mean it when you ask.

As you stand to leave, shake the interviewee's hand and thank this person for the time taken out of a busy schedule to help you. Use the word, "help."

And, as you're leaving, if the interaction has been favorable, you might say, "You've been so helpful. If I think of something after I leave or when reviewing my notes, would it be all right to call you again? I promise not to make a pest of my self."

If this courtesy is extended, try to get the individual's business card and ask what times of day are typically bad or good if you should call again.

Don't gratitude jes warm yer heart?

Think about it. When you make a hand-motion through your windshield, telling the other driver to go ahead of you or step aside in the line at the checkout counter to let the lady with her arms full of groceries check out before you do, are you like me? I'm happy to be courteous and helpful. But, I really would like my gesture to be acknowledged and appreciated. I'm annoyed when the driver goes ahead of me without a wave of thanks, or the lady in the grocery line just steps in like my personal space was reserved for her, and it's about time I figured it out.

I've received a free education more than once from people who were glad to stop their own work and answer my questions. So don't imagine I dress in a tutu when I say, "Send a Thank You

card.” (Select one without flowers and lace along the edge though – unless you’re trying to convey something different than I would be.)

So, within a day or two of your visit, drop a small thank-you card in the mail addressed to that person’s attention with a one or two sentence, hand-written note of appreciation for the time spent with you and the help given. Do not promote yourself or your firm in any way in this note, but do include something specific like, “Thank you for helping me with my questions regarding construction layout.”

Remember, by the time a couple of days have passed since your interview, the interviewee has likely forgotten you. Give some clear clue to bring you back to remembrance. If you merely say, “Thanks for meeting with me,” the person may not connect a jogged memory of you to the thank you card.

You might even consider including a coupon from the local donut shop with a note saying it’s a token of appreciation for taking the time to help you out. This way, you’re thought of once again when the coupon is redeemed.

The last thing I want is to give an ungrateful person tips on how to fake gratitude for the sake of marketing and sales. But, that’s not you. If it were, you’d be calling me during the dinner hour to sell me a time-share vacation package to Fargo in January.

But, I’ve been surprised by the benefits of showing gratitude. It’s a vanishing trait in our society, so you get a chance to bless someone and yourself at the same moment. Isn’t that great?

The Worst is Over

Well, I’ve digressed with that Thank You card idea. So, you’ve finished your first interview. You’ve learned a lot. You’ve just done real marketing, and it really wasn’t as hard as you’d imagined.

Your mission was to find out if there is a need, a market for something you offer. It has been your first “cold call,” and it’s behind you. The next one is easier. Perhaps you’ve even gleaned a name to contact for your next interview and a name to drop when you get there. Don’t let your shoes cool. Make another call, and then another call. And, keep it up until you know what it is you have to offer and to whom.

Northern Virginia in the mid 80’s and Northern New England in the early 90’s

Different geographical locations go about construction layout in very different ways. In the mid to late nineteen eighties, I founded a construction layout business in the Washington, D.C. suburbs of Northern Virginia, primarily in Fairfax County and eastern Loudoun County. Contractors were not generally allowed to begin construction of any specific construction until a county inspector personally delivered a “cut sheet” to the site. Much of the booming development in the Dulles Airport corridor was what construction management firms termed, ‘mid-sized development.’ Due to a high degree of regulatory oversight and the resultant

complexity of paper documentation, licensed surveyors performed most of the construction layout in Northern Virginia.

I was licensed as a surveyor in a few states by that time, but not a licensed surveyor in Virginia. Therefore, I functioned as a contractor providing construction layout services. Most measuring and staking for construction did not require the seal of a licensed surveyor and was not defined as “surveying” by that state’s statutes or administrative rules. The main exceptions were as-built surveys and setting final corner monuments. These functions must be performed by or under the direct supervision of a licensed surveyor. Usually, a surveyor employed by a project’s engineering design firm performed these tasks. Because I was not a licensed surveyor, services requiring the signature and seal of a licensed surveyor were simply not a part of my contract for construction layout services.

An important aside to those who are *not* licensed professionals: It’s critical if you’re providing construction layout to not inadvertently cross over a legal division line and provide measurement certifications, mapping or reports requiring professional registration.

It was difficult to fail at business in Northern Virginia during the mid-1980’s. Development was peaking. Design professionals serving the rapid development had too much work. In general, construction management firms told me that large engineering/surveying firms were not responsive to their construction layout needs. Rapid development was stressing construction management firms, contractors, and surveyors alike.

In Northern Virginia, my capabilities and a “market” met, and I prospered by providing my clients’ needs. My business in Northern Virginia was an immediate success.

Just a few years later, in northern New Hampshire, I learned through marketing that I stood a snowball’s chance in hell of getting a single contract for construction layout, and I might as well not even put forth a sales effort in that market. In that rural environment of northern New England, most layout was performed by the bulldozer (no layout at all in other words). When stakes were actually needed, the contractors set their own. Exceptions were rare.

The mission in your marketing effort is to determine whether it’s feasible for you to promote construction layout services. When making your marketing cold calls, you are not selling anything; you’re determining *if* there is a market. This puts the people you talk with at ease. If there is a market, they will steer you in its direction. They may even ask you to bid on a project or just plain hire you to do something for them. But, that isn’t what you’re there for? Don’t ask for work in this meeting.

After Marketing, What?

After a dozen or two interviews (or at least a few), pause to digest what you’ve learned. You could become so good at interviewing that you forget why you are doing it. At some point, and you need to discern when, its time to offer services that you know are both needed and typically hired out.

Ask yourself, what is the most common complaint I've heard. What is it that I can offer to make the lives of the people I've interviewed easier or less troublesome? What do I have to offer that others providing service can't or don't give their clients?

Don't underestimate that you've recently developed a relationship with the people you've interviewed. They've helped you, and they've probably liked doing it. That, after all, is the basis of your relationship. Now, take it to the next step.

Make contact. Tell them you'd like to work for them and serve their projects. Tell them you know you can do what they need and you want the opportunity. Ask them how to best go about that.

Listen and follow their instructions.

But remember, this is not a marketing session; it's sales. If they already have someone who "does all their work," ask if it wouldn't be better to have two good someones? Suggest that maybe they'd be willing to throw you even a small job, just to see how you do. Or, perhaps there is some unusual task or immediate need you could meet. Ask if there is a project coming up for which subcontractors have not yet been selected. Can you bid on it? Suggest, ask, and be persistent. Don't be afraid to appear excited and eager.

But, don't be arrogant or demanding. Think of the stray puppy that won't leave your doorstep, but just keeps smiling at you with a look that says, "You are the person I've been looking for. I'd be a great pup if you'd just open the door and let me in and feed me." OK, you're nobody's pup. I understand. Just realize macho has its limits, and sometimes being likable and eager to please will get you what you need. Maybe that doesn't fit your personality. But, something does. Find it and stick to it.

Sales – a little understood profession

Once driving 30 hours alone in the car, non-stop from Florida to Connecticut, I listened to recorded teachings on successful sales techniques. I listened attentively the whole way as it kept me interested and awake. Also, it transformed me.

Prior to this road trip, I viewed sales as a profession suited only to pushy, self-centered, foot-in-the-door sorts of people. After that 30-hour, sleep-deprived indoctrination, I realized the central role that legitimate and professional sales play in the well being of our nation. I came to understand that "buyer objections" are often presented so that you can help the person overcome them. Sales, I learned, is the act of helping people to have what they want in the first place, not manipulating them into spending for something useless or taking money out of their pockets just so mine could be stuffed.

If you, like so many people, feel that to sell your services would be to sell your soul in the process, may I recommend that you read or listen to teachings on sales? I've come to respect sales and see its role in the wellbeing of our nation's economy – not just my own. Selling your services is largely letting it be known that you are qualified, responsible, dedicated, capable, ready to serve and seeking to meet the needs of your potential clients. And, it's important to sense when this point has been made, and it's time to ask for a signature or a contract – to 'close' the sale. This course is not on sales, but many good courses are.

Bidding

OK. So, you've marketed and determined the need. You've sold yourself, or you've seen a request for proposals or maybe learned through the grapevine about some upcoming project. You've been asked to provide a bid or proposal. You need to get a set of plans, review them, estimate the time involved in providing what's required for the project's construction layout, put numbers to the effort and come up with fees for your proposed services.

First, determine whether your potential client has actually been awarded the construction contract.

If not, a general estimate may suffice.

Some construction management firms seek construction layout estimates just to determine construction layout fees they should expect IF they are awarded a contract THEY are bidding on. It's important to know if the firm asking you for a quotation of your fees has actually been awarded the contract for that specific project, or are they are bidding on it themselves and wanting your estimate of layout services in order to fashion their own bid?

There's a difference between your bidding to obtain a contract for your services and working for free for a prime contractor seeking their own contract – a prime contractor who may or may not use you even if they *do* get the contract themselves.

A dilemma is a situation in which there are two choices, and they both stink. The dilemma in this case is:

- Choice #1, to invest in bidding for a firm that's also bidding and may not even be awarded their contract, and may not give you a contract even if they get one themselves, or
- Choice #2, to decline making the effort, almost certainly knowing that firm won't call you if they do get the contract.

What to do in this loose-loose situation?

I found my solution in a third alternative. I determined through a joint investigation with a client that full-service, construction layout fees for mid-sized, commercial projects having one- or two-story buildings ran somewhere around one half of one percent (1/2%) of the total construction costs for the project.

With this formula, I was able to throw an approximate number at most projects simply by asking the person asking me for a quotation, what approximate construction costs were expected to run for the project. Knowing this, I could offer an estimate over the phone based on this formula:

\$1,500 + (1/2% of the construction costs) + (add \$2,000 for an artistic layout of parking and drives or subtract \$1,000 for a dull, rectangular parking and drive configuration)

Thus, for a project with total, expected construction costs of \$4 million, the cost of providing full-service, typical layout costs runs roughly \$20,500 to \$23,500. If an as-built survey is part of the contract, add that in, but often it's not included in the construction management firm's proposal.

Construction layout costs are a very, very small part of an average, mid-sized construction project. Even if *complete* layout of typical items is contracted, as it was in Northern Virginia, it's still a rather small part of construction costs.

The above formula is an example, not one you should apply unless it fits your own experience. Once you gain experience providing typical services to projects of similar scope in your own region, then you may be able to provide rough estimates, but clearly qualify your quotation as such. This will save you lots of time.

Of course, if you're hungry for work and have nothing better to do, then go ahead and take the time to prepare a solid estimate, one you're willing to live with if you eventually do get the contract. It all boils down to whether or not you have a standing relationship with the firm requesting your "bid" and what that relationship or lack of relationship suggests.

The decision whether or not to provide a fee quotation to a firm seeking a contract themselves is a business decision and should be viewed as such.

If you've determined the firm requesting the number from you does not have the contract they themselves are seeking, don't be afraid to ask, "If you *are* awarded the contract, will you award the construction layout contract to me?"

Consider the odds:

Suppose a firm asks you to bid on a project they don't yet have, but if they should be awarded the contract, then they will then put you in a competitive bid situation for construction layout with several of your competitors. Let's assume that firm gets about one in seven projects they bid on. Perhaps you get one in five awards for proposals you furnish. What are your chances of being awarded the contract? Low!

But, if the firm asking you for a number to include in fashioning their own bid habitually uses your services exclusively or nearly exclusively, your chances are nearly one in seven, and that's as good as it gets. Not so bad, really.

I've received calls from firms that I suspect will never use my services, asking for a bid on a project they don't yet have. Usually, I've politely declined, thanking them for thinking of my firm—or I've thrown an approximation at them, like the example above, stating that I'll be happy to provide a firm number should they be awarded the contract.

Of course, you need to be careful about turning potential business away by being uncooperative or unresponsive. If you can afford the time it takes to meet their need, use it as a sales opportunity. Show them what its like to work with you.

Be alert to mathematical patterns of past fees for completed projects. Develop rules-of-thumb for typical projects and carefully track your completed project costs with actual assessments of your fees, profits and losses. The rules-of-thumb you develop will save you countless hours of

unbillable time estimating fees and help you not to run up your fees on the jobs you do get to cover your overhead for bidding on ones you didn't get.

If the firm requesting your bid already *has* the construction contract, then get very, very specific.

If a firm requesting an estimate or bid already has a contract themselves and is truly in a position to award a contract for construction layout, I'll almost always provide a bid. As covered in the section of this course under Contracts, my bid and my contract are one-and-the-same document, called "A Proposal."

It takes time to review a set of plans and to determine the extent of layout the particular client is accustomed to needing or desiring. In my experience, the time involved varies greatly from client to client, from project to project and especially from one geographical area to another.

The key question to remember here is, what is the statistical probability of receiving a contract from this bid, and what is the promotional value of taking the effort and time needed to provide a firm bid? If you get one in five contracts you bid on for firms that already have their own contract in hand, and your average project costs you four to six hours to review a set of plans and make a formal bid, then the average project you're actually awarded must cover twenty to thirty hours of your administrative time spent bidding.

Bidding, contracts and client relationships are probably the hardest, most daunting aspects of developing a construction layout business. It will try your wits and test your patience, and the faint-hearted small-business owner may wilt. But, don't faint yet. The rest of this course will prepare you with the most important I've learned, and that – with serious, consistent effort on your part and what some call luck (I call grace) – will carry you a long way toward success.

How to win playing the 'Apples and Oranges' Game

You've heard the expression, "You're comparing apples and oranges."

What's meant is that some significant differences exist between two things being compared, and therefore the comparison is invalid. When bidding construction layout, this is a big problem. More on this in a minute.

Should you review a set of plans, draft your proposal, stick it in the mailbox and hope for the best? There's probably a better way.

Some firms prefer that you review a set of plans in their offices, but I almost always request a set of site plans and foundation plans that I take with me, mark up and keep. Generally, this request is granted. The site plans show the site improvements (clearing limits drives, utilities, building location on the site, property lines, etc.) and the building foundation plan shows the complexity of the footing design and column layout. The extent of construction layout required (and thus my bid) is based primarily on the amount and the complexity of the specific project's layout.

If there's any way I can actually possess a plan set to keep, I'll go for that, even if it means having the most relevant-to-bidding sheets duplicated at my own cost. Another reason to retain

copies of the plans is to determine that no significant changes to the plan are made between the time of making a proposal and the awarded of a contract.

On my copy of site plans, I high-lite features to be staked in different colors to distinguish them. A map-measuring wheel run along the high-lited lines determines the linear feet of pipe, curbing, etc. Distinct colors make counting the number of storm and sanitary structures, hydrants, tees and valves a relatively fast procedure and generally insure I've not overlooked something significant.

In different geographical areas, curbing is constructed differently, and these differences change the amount of layout normally requested. This can greatly influence both the intensity of the layout needed.

Now to explain the “apples and oranges” game

To be a successful bidder, one must play this game very, very carefully. Basically, the problem bidding construction layout services is that your competition may consider the layout needs to be less intensive than you do. Suppose both your bid and your competitors' bids list the identical line item, “Stake Curbing.” In each of these bids, a fee is associated with that item.

Your potential client assumes you and your competitors intend to provide identical services, and the only variable between you all is the fee associated with that same service. Yet, you and your competition may have vastly different intentions.

For example, in areas where monolithic, concrete curb-and-gutter are used, the majority of the curbing will be constructed by a machine following a string line the contractor sets from construction layout stakes. This type of curbing is constructed prior to paving operations. In other geographical locations, bituminous concrete (asphalt) curbing is set on top of previously constructed pavement.

Normally, concrete curb-and-gutter requires a significantly increased amount of stakes set to govern its construction than does bituminous curbing. Concrete curb and gutter layout should signal transitions from gutter sections pitched away from the curb to areas where the gutter slopes toward the curb. Stakes should indicate where depressed curb sections for drives or handicapped access or sidewalks occur. Staking high or low points is also necessary.

Why stake all these features? Why not just place stakes every 50 feet? Very few visual clues exist on the site to guide the contractor installing concrete curb-and-gutter, because it's often the first, surface site-construction to appear once utilities are installed. Skimpy layout that omits high points, low points, transitions from catch-curb to spill-curb gutter sections, depressed curb sections and handicapped ramps breeds the potential for costly construction errors. And these might be considered the fault (omission) of the construction layout provider.

Often, the laborers preparing the construction from your stakes are not the best at reading and interpreting plans. If your stakes don't draw attention to the above described curb changes, those features may be overlooked during construction. Concrete curbing is difficult to demolish and replace when errors are discovered after it's built. If a section of depressed curbing is omitted and the construction manager asks the curbing contractor for the reason, you don't want the answer to be, “Well the layout person forgot to stake it.” At this point a debate rages as to

whether the contractor should have seen this from the plans or if the construction staking should have included this important feature of the curbing.

Using concrete curb and gutter staking as our example, let's examine how the apples and oranges game is played.

If your bid includes thorough staking for curb-and-gutter, but your competition plans to stake at 50 foot intervals, regardless of what happens in-between, or to stake gentle horizontal curves in the curbing at 50 foot intervals, but you know the contractor really needs stakes set at 25 foot intervals for these curves, you are not competing on an equal footing. Your competition is not offering the same product you are. The "Stake Curbing" line item you and your competition list in your bids is an "apples and oranges" situation, or you might say a "Cadillac and Chevy" situation.

Before submitting a bid for a complex project where the client has not specified precisely the degree of layout required (which is almost always), I request an opportunity to speak briefly in person with the project manager or the person who will be overseeing the bidding process. My stated purpose is verifying that my proposal and the client's needs are in harmony.

If asked whether this meeting is necessary at the bid stage, I say that it is in the client's interest to avoid future "extras" or "hourly" fees that my firm or a low-bidder's firm may generate. These terms (extra and hourly) get the attention of general contractors and construction managers. Normally, dropping these words will get you the meeting. Saying the word, "extra" is like saying, "crash" in an airport control tower.

I call this the "Pre-bid Meeting to Define Scope." At this meeting, I start playing the apples and oranges game, and I'm playing to win.

Pre-bid Meeting to Define Scope

Remember, you're only .5%. Be succinct.

Remember the little ellipse at the bottom of *Figure 1*? For providing *full-service* layout on a typical, mid-sized commercial development project, your total fee amounts to ½ of 1 percent (and sometimes even less) of the project's construction costs. I can't remember bidding for a construction layout contract exceeding a few thousand dollars without first having a preliminary meeting with the construction management firm's project manager or superintendent. Whether I get my own set of plans to keep, or I'm forced to review plans in the construction manager's office, I will always review the plans, formulate my notes and questions related to the specific project, and only then ask for a meeting.

No construction management firm has ever refused me the opportunity to meet briefly with them. In requesting the meeting, I explain that I've reviewed the plans, and that has raised questions related to the project's layout requirements. I tell them I need to ask just a few questions. I want this meeting to be in person, so I'll make every attempt to make that happen. If asked why this meeting can't take place over the phone, I'll say that some of my questions require pointing to specific plans and it will take less time and be simpler to meet briefly in person to avoid miscommunication.

Best time for sales

If you know your stuff, this meeting is a soft-sell opportunity during which you show your interest, diligence and knowledge of your client's needs. Construction projects are complex happenings. If you're sensitive to the nature of construction processes and to the functioning of the team that turns designs into 3D reality, you'll be a step ahead of most of your competition. If you're new to construction layout, simply state that you're aware that different firms require vastly different amounts of layout control, some providing most of their own control after basic points are established, and others preferring to have almost all construction control set by a specialist. Ask what your interviewee's firm historically requires for layout of similar projects.

As noted elsewhere, the construction management firm may have an assistant project manager assigned to the project, and this person is typically (though not always) somewhat inexperienced. This person may be a recent graduate working through a career path and handling some of the nuisance functions the project manager is pleased to off-load. If you do end up meeting with an assistant who appears to lack specific experience, ask a few questions that you know this person can't answer, and then ask if you might meet with one of their superintendents to seek some specific guidance about what this firm generally requires. Explain that the variables in actual staking provided to different firms are endless, and you don't want to either inflate your bid with fluff or fail to provide realistic fees for your layout by leaving out any service the firm normally wants.

Amount of layout required – Questions to ask

In the construction layout business, profit or loss is primarily determined by the relationship of time spent to fixed fees. In order to create a proposal or submit a bid that's truly suited to both the client and the project, you must find out specifically what is needed.

Consider asking the following questions.

- Will you require clearing limits to be staked?
- Will you need rough grade staked, and if so, do you envision a grid approach or a features approach or a combination of both? (Having become familiar with the plans, you are probably in a position to suggest what's needed, unless the client already has thought this through.)
- Do you require full runs of utilities staked or just the structures themselves? Many utility contractors will set storm and sanitary pipe grades with a laser device that's set in the structure and projects a beam of light to keep the pipe that's being laid both straight and at a constant grade. This makes offset stakes set along the run of pipe of little value. This is a place to beat your competition at the apples and oranges game by specifying layout at structures only, if a laser is to be used.
- Will a control rectangle suffice for building construction or will multiple corners be staked and offset both ways? Will all column lines be staked or just a few major lines? Will the footings be marked with wall corner locations for forms or block work?

- How much control will be needed for drives, roads, parking, etc? Ask if curbing or parking and driveway layout is typically at 50 ft. intervals for straight sections and 25 ft. intervals for curves, with short radii staked directly. If GPS control on dozers and graders will be used, how much primary control will you be staking and where?

Find out as much as you can about what the client wants for the project you're going to bid on and make your bid or proposal reflect those wishes.

What client equip. & personnel will supplement your layout?

Generally, but not always in my experience, new additions attached to existing buildings require little or no layout. However, this should not be assumed. Ask.

Some building contractors provide their own layout entirely. Others work from minimal, primary control that you provide, and still others expect considerable layout provided for them. Which is it? You need to know and to specify precisely what you include in your proposed fees.

Ask lots of questions, but keep perspective – not your own. Realize that your fees are likely to be 1/2% or less of the construction costs for an average, mid-sized commercial project, assuming ALL construction layout is performed by you with the exception of building control within the structure once it comes out of the ground. Your 1/2% is a tiny part of the whole project. Don't think the project manager or superintendent wants to spend the whole day in your company. Get in, ask your questions, make your impression and your points, and get out. Respect the construction manager's time and other priorities.

Some general contractors provide the lion's share of their layout using their own employees and equipment. Others view their role as strictly management and oversight and provide neither layout nor checks of layout on their own. You need to assess your client's participation in the layout/verification role and what exactly you will be expected to provide and not provide.

Opportunity to save client money with suggestions as to scope

If you know your stuff, occasions will develop for you to suggest ways to minimize layout or to combine layout to your client's advantage. The construction management firm is always looking for ways to "value engineer" their projects. If you make a suggestion that saves a trip to the site, eliminates or combines layout or otherwise saves the client money and time, you will be appreciated. The more experienced you are and the less experienced the client, the more opportunities arise.

But, realize that your fresh set of eyes may see something the client is too close to the project to see. Never get haughty, but humbly ask if your suggestion might be useful or appropriate.

Low Bidder – Apples and Oranges – and Extras

The primary focus of this pre-bid meeting includes getting a sense of what exactly is anticipated by the client in the way of layout services. This is a critical matter to both you and the construction manager. From your point of view, if you include more services in your bid than your competitors, you will most likely not be the low bidder. In the hustle and bustle of your

client's office, it's conceivable that some administrative assistant or lower-level employee will sort through the bids, not really understanding them and just enter a bottom line total from your proposal alongside that of a competitor who omitted some line items deliberately in order to come in as low bidder.

The consequences of your leaving out significant functions in order to be competitive with such folks are the generation of extra charges, change orders and hourly billing. And, this makes you very unpopular with your client. While in your meeting, state clearly that other bidders for the construction layout may play this "apples and oranges" game at the construction manager's expense and frustration. You don't want to do this, but you need a level playing field in order to be successful. Ask for an assurance that line items in the construction layout bid will be considered and compared.

In a humble posture, let the person you're meeting with know the games your competitors play when it comes to construction layout bidding, and tell them what it can mean to the project – unanticipated hourly fees and extras. Let them know that you're between a rock and a hard place: You don't want to leave things out of your bid, but you know others will, and you don't want them to unfairly underbid you. Your concern is that a competitor uses this tactic, gets the award and later throws lots of "extras" at the general contractor for items that should have been included in the original scope of the bid.

Get quiet, and listen to what you're told in response to this. You may be given some tips on how to frame your bid. You may get a commitment that bids for construction layout will be reviewed carefully, and that bids leaving out important items will be rejected as unresponsive. This is what you want. Again, try to get a commitment – the person's word on this.

You may receive a frank admission that low bid will prevail no matter what. In this case, try to elicit an agreement that you will not be looked down upon for stripping your contract services to the bone. Any helpful, sympathetic or candid response will mean this person is to some measure 'in your court.'

Most importantly, you establish dialogue with your potential client about matters important to the success of his or her project, and you'll leave the impression that you're a person who is wanted on the team. If this person WANTS you, you may find that he or she finds a way to make it happen, no matter what public face is put on the bidding process. You want to be remembered as the person who went the extra mile at the very beginning of the project to assure a smooth, hassle-free, professional, team approach. Do not underestimate the potential in this meeting to set you apart from your competitors.

It may be appropriate to say when leaving something like, "Well, I really do want this assignment. If there's anything in my bid that's extraneous or seems out of line, I'll be grateful for the opportunity to review it with you."

Strictly a low bid situation?

Firms have called me in to discuss my bid and essentially told me what I need to change in my proposal to "make it happen." Generally, the change was something I could live with. Flexibility sometimes appears where none is thought to exist. If you are wanted by the client, the client can

often make it happen. Most of your competitors will not pursue a client in the way I've suggested, and this pre-bid meeting may create a strong advantage if you're sincere and capable.

Of course, if the situation is strictly a low-bidder-gets-the-award, then there will be no room for negotiation. I've been on both the winning end and the losing end of situations that appear to be strictly low-bid but are blended invisibly, if not secretly, with a negotiated-bid approach to the award. The key is to get the best information you can and tailor your bid to the client and project. If clients want you, they often find a way to make that happen.

In some cases, you may determine it's best to break your proposal into two categories: Essential or Expected Layout and Optional Layout. Using this approach, you place only truly essential construction layout in the first category and other things you think will be needed in a second category. My advice is total the first grouping and do not total the second. Make the optional items an addendum on a separate sheet, and pay attention to your graphics so that "Optional Layout" is in distinctive lettering. Remember, you are playing the apples and oranges game to win. When playing against tight competition, never get "flowery" and include everything you can think of.

What if the client beats you down?

If your client cuts corners violently and squeezes you tight, then omit all fluff. Get the contract. Later, when layout is requested that's beyond the scope of your proposal, bill it as an extra or as hourly fees.

Often a recent graduate of a construction management educational program is assigned to the grunt work involved in procuring bids and sifting through them. You generally want to meet with a decision-maker, but if you have no option but to meet with a young person who you deem is "wet behind the ears," use the occasion to respectfully educate this person to the construction layout function, its significance, the importance of responsiveness to calls for layout, and the "apples and oranges" game construction layout competitors play. Sell your capabilities and stress anything that sets you apart from the competition.

Tactfully instruct this inexperienced person. Say that you know specifications seldom address the critical services you provide, resulting in wide variations in the actual usefulness of the layout provided by different firms. And, you realize that final costs for construction layout often run well above original bids. Let them know you're sensitive to the fact that sub-standard and unresponsive layout contractors significantly impact the project, causing delays, confusion and frustration. You understand this. You take their project seriously, just as they do. You are the one who cares, and you're available at any time to answer any questions that may arise or to help in any way you possibly can.

Seldom have I been unsuccessful with this approach to "bidding." Don't think of bidding as reviewing plans and throwing numbers in an envelope. Look at the big picture. Construction is a team effort by nature, and the bottom line for most subcontractors is their own interest and profits.

If you genuinely care about the project, have a heart to serve others and take your place on the team through diligent performance, you *will* stand out – and that's that! If you are such a person, the world is searching for you.

Summary – The Bidding Process and the Pre-bid Meeting with the Client

If you can't get a contract for layout services, it matters little what your capabilities are or how expertly and professionally you'd serve those clients you don't have. Knowing the strategies discussed above should net you an edge over your competition. Much of your success in the construction layout business is linked to activities that are beyond the physical act of setting control:

- Applying marketing and sales strategies that work – each in its time
- Understanding the inner structure of the construction management firm and how to relate to your client's project team members
- Knowing how much layout is typically required in your region in general and specifically by the clients you wish to serve
- Knowing how to play and win the Apples and Oranges game
- Structuring your proposal to fit the specific needs of both the client and the project
- Establishing yourself as a true professional – one who places himself or herself in the head of the client and serves from the heart

A word to employees

If you are reading this as an employee whose job places you on the sites, actually performing the layout, please don't think the sections of this course related to business are not for you. What you learn will benefit your employer in several ways.

If you know how much effort goes into getting the contracts that net you a regular paycheck, you'll be more appreciative of the fact that you can pretty much go home at night and forget the job. Most employers can't do this.

And, you'll appreciate more as the course develops how knowing the obligations and limits of your boss's contract make you confident as you work. You are clear-headed when approached by the client with a work request. You need to know what your boss is and is not obligated to perform on a set-fee basis and be able to handle requests for additional work with ease.

The more an employee understands the boss's and the client's business relationship and the considerations each must balance, the better employee you'll become. Knowing what is in the contract and taking care to meet those obligations without doing extra work for free increases your value as a team member. You'll stand out as one who's thinking and acting beyond the norm.

It's a terror to your employer to have non-thinkers doing their construction layout. You'll be appreciated and rewarded as your diligent performance and business sense becomes evident to your employer.

As an employer, I can state with certainty that I can find and hire a party chief for boundary and topo surveys far more easily than a party chief I'd trust with construction layout. The survey crew that knows its stuff at construction layout is a rare find.

CONTRACTS – This section does NOT constitute legal advice!

A wise person offered the following advice long ago, and I've never forgotten it:

"A lawyer is like a bulldozer. Hire one a size larger than the job requires, and you'll save money in the end."

Bid the Professional Way – Submit a Proposal

My proposal essentially becomes a legal agreement or CONTRACT when signed by the client and returned to me. If the client signs my proposal and returns it to me, my offer is accepted. My proposal doesn't have to *look* like a contract, but it should function as one. That is, it should obligate me to perform certain, limited and well-defined services in exchange for specified consideration (money), once my client has signed a copy of my proposal and returned it to me.

Decades back, professionals did not enter into competitive bidding. Bidding was unprofessional conduct. Even though competitive bidding has become commonplace for professionals who perform construction layout, I don't submit BIDS; I submit PROPOSALS. Personally, I believe the construction layout services I offer are clearly professional in nature. I don't care if a client selects me because my fee is the lowest or because I'm the best qualified or for any number of other reasons.

Suppose a client has decided, based on my proposal, that I'm their pick. They just sign and return a copy of my proposal, and I become the official provider of their construction layout services, right?

Probably not, except for small business clients.

The reason is that larger construction management firms have their own, standard contracts with standard boilerplate language that they use with all their subcontractors. They add some wording to a blank area of their standard contract form and send it to the bidders they've selected. Because of this, larger firms seldom sign my proposal and may not even reference it in their contract. We'll come back to this later.

Before taking this topic further, let's briefly look at the nature of contracts to better understand what is at stake.

Contracts – Nature of Contracts

Again and again I say, I am NOT a lawyer. I'm a surveyor. I speak from my experience and what I *think* is true. If you want sound legal advice, ask a good lawyer. If I should fail to state clearly that I'm not offering legal advice, and you got bad opinions or bad legal advice from me, I could probably be held liable for representing my self as a lawyer, which I'm not. So, if I give you bad advice and you follow it, you're up a tree.

Keep in mind, though, if you get bad advice from a lawyer and act on it and find yourself in a legal jam, you probably can't sue that lawyer. (There's justice for you!) In fact, that same lawyer will be happy to represent you in the legal action that's a consequence of having followed his or her original counsel. This way you get to pay that lawyer for both the bad advice and for representing you in the legal action you'll probably lose because of poor legal representation. (Did you follow that? Read it again if you need to, because it's an important point.)

The difference between following my bad advice and a lawyer's bad advice is that you get to pay thousands of dollars for a lawyer's bad advice and incompetent representation. My advice is free, is worth every penny of it, and comes with a money-back guarantee.

Simply put, here's the point: Get a *GOOD* lawyer, not just any lawyer. Get one experienced in what you need help with. Ask around. Have a preliminary consultation, even if you have to pay for it. Second point: Don't take my personal experience or even my opinions related to legal issues in this course as expert legal advice. What I say about contracts or other matters of law comes from personal experience and my own research. I honestly believe I'm conveying reliable information, but I relate these admittedly inexperienced opinions to prime the pump of your own interest and investigation.

That said, what can we say about the nature of contracts?

First, there are two parties to any construction layout contract.

Second, Two parties acting out of their free will have a legal right to agree to anything that doesn't violate the law, and to bind one another to perform or comply to the terms and conditions of their agreement.

Third, the party who drafts a contract or causes one to be created is favored in that contract to varying degrees. This happens naturally as the consequence of a lawyer's involvement (ever the advocate of the party who hired that lawyer). Yet, contracts written without professional legal help generally bear the stamp of human nature, which also exhibits a strong tendency to look out for ol' number one. So, whoever writes the first draft of an agreement is inevitably more sensitive to their own concerns than those of the other party.

Fourth, an agreement reduced to clear and unambiguous writing is generally held to represent ALL the intents of the parties as specified in the particular agreement. A claim of intent contrary to that in the clearly written agreement will seldom prevail against what has been written in the agreement. In essence, the intents of the parties expressed in a well-written agreement cannot be overcome by any verbal agreement that differs from the written agreement. I've heard people say, "Well, it says that in the contract, but I won't hold you to it."

My reply is, “Oh, I’m glad to hear that.” I say those words as I take a pen and cross out whatever the contract says that the person said I wouldn’t be held to. (It’s hard for them to object at that moment.) If a contract says I will be held to something, but the other party to the contract verbally asserts that I won’t be held to it, guess what. A court will hold me to it. Don’t ever be shy about insisting that all verbal agreements are clearly stated in writing.

Writing your Proposal - Specify, specify, specify

OK, we’ve kind of jumped ahead in the sequence of getting a contract to discuss the contracts themselves and contract issues. We’ve seen why the specifics of your proposal are so important. With small clients, your proposal will likely become your entire contract. It better be well thought out. With large clients, your hope is to have your proposal referenced in and made a part of the contract. Again, it’s very important to specify clearly and thoroughly what you will do and what you’ll be paid for doing it. Even though your fees represent such a small percentage of the project’s construction costs, those fees represent your total revenue for your participation in the project, and it’s important to you. It’s your business, and proposal writing deserves care and diligence. If you fail to specify, you fail to limit your scope of services. Yet, your proposal has established set-fees for all or most of those same services. Lack of specificity may lead your client to expect more than you’ve envisioned performing for your set fees. This may lead to disputes and hard feelings, both of which are bad business.

Surely you’ve heard the saying, “Good fences make good neighbors.” A clearly written scope of services is that fence – a dividing line between what you owe your client and what your client expects of you and owes you. If your client asks you to perform beyond your scope, then your client owes you some extra compensation. If you stop short of providing what you’ve promised, then you owe your client. When the line between who owes whom becomes fuzzy, trouble and hard feelings will surely follow. The moral? Specify!

How many toilets –or– how many stakes?

When specifying, remember this. The construction manager’s bidders are mostly constrained by plans and specifications to provide only certain products or equivalents, installed or constructed to known codes and standards. The plumber, for example, will install a certain number of the specified model toilets in certain locations to certain building code requirements. His work will be inspected to guarantee compliance. Plumbers will compete against other plumbers on a more or less even playing field. It’s the same for electricians, masons, etc. When preparing bids for construction layout services, you and your competitors may have vastly different levels of service in mind.

Why your proposal gets so specific

The project’s design plans tell the plumber exactly what he must provide. But, the plans offer no specific guidance as to what will be physically staked to control or guide construction. The plans never show what specific features require layout or the intensity or scope of required layout.

So, how does anyone know what is needed or what terms and conditions are appropriate for construction layout in general or this project in particular?

You, as the provider of construction layout and control seldom perform to any well-defined requirements or industry standards. Your performance in the construction process is rarely defined specifically in writings other than your own. Someone must determine and reduce to writing how many stakes will be set during a maximum of how many calls to the site, etc.

Seldom has a client specified exactly what they want without my asking, not even when it comes to what level of control will be provided for the building layout. This is why the pre-bid meeting is essential. If you decide unilaterally what your client will want, you have no excuse when the client later demands something different. Remember the point stressed at the beginning of this course: The client is the expert in what they need; you are the expert in giving them that.

Creeping-Up Scope Syndrome

On the other hand, if your proposal language is vague and leaves what you intend to provide open to your client's personal interpretation as the project unfolds, watch out for the disease called, "Creeping-Up Scope Syndrome," or CUSS for short.

Without a well-defined scope of services, someone is likely to cuss.

Your client may ask you for more and more and more layout, way beyond what you envisioned would be required. Your client may argue, "The site superintendent knows what layout is needed, and you're the person hired to provide layout, so why are you saying it's not your responsibility?"

If your proposal is vague as to limits on what you will provide, you're open to such conflicts.

If your proposal is SPECIFIC, your reply when asked to provide some layout you've not foreseen is, "You know, I certainly can provide that for you, and I'd be happy to do it. But, it's beyond the scope of my proposal, and I'll just need you to sign a work order authorizing it as work to be performed on an hourly fee basis. It should probably take me two or three hours. Is that what you'd like to do?"

I have never, never had a problem using this approach. Generally, the person ordering the work is happy to place a signature on my work order, and I've never had the client's accounts payable staff refuse to pay IF my work order bears the signature of their site superintendent or project manager.

Assumptions

To keep your proposal fees or bid low and avoid future arguments over Creeping-Up Scope Syndrome, you should state in your proposal what assumptions are made in quoting your fees. They may or may not be specifically listed as assumptions, but you should keep clear in your mind what you are assuming and be certain to put in writing what you feel your client needs to understand and accept.

Some assumptions can be briefly conveyed with a few words added to a line item. For example:

Fee	Item	Description
\$3,200	Stake Curb	50' intervals except 25' intervals on curves + high/low & HC ramps

Others require a sentence or paragraph. An example is given below:

Fees within this proposal are based on plans dated [such-and-such]. Significant or general revisions necessitate time to review, recalculate and change the layout and will be billed per the *Table of Hourly Rates* attached to this proposal.

In addition, you should state an assumption that a digital drawing file will be provided for all the site drawings. Working from paper plots or reproductions of development plans alone will be time consuming. Nevertheless, you should require a paper plan set from which to stake improvements. These become valuable documents if you're accused of NOT staking according to the plans. Your digital files may change as you work with them, but the paper plans are excellent evidence of what you were directed to stake. Unless specifically directed otherwise, those paper plans are your boss. Your client must be made responsible for advising you of revisions to that plan set you've been given at the start of the project. More on this is found elsewhere in this course.

Specify that quoted fees assume that calls for layout provide a minimum notice, say two full business days, and that layout requested on an emergency basis or requested to be performed other than during normal business hours will be performed at your standard overtime rates subject to the availability of your personnel for the times requested.

Another standard assumption is that you are provided physical starting points in the field and the geometric data as discussed below.

Finally, if you are not a member of the firm that made the engineering design, or if you are not the record surveyor, your starting point for layout services is to get data and possibly points set in the field from these other professionals. I highly recommend that you state in your assumptions that your services can begin within so many days of receiving necessary plans, files and data from the record surveyor and design engineer. Make this small print, if you do include it. The record surveyor and design engineer can hit the ground running, because they already have this information. If you are not careful with this, you end up selling the wisdom of hiring those people for the layout. Face it; you will probably be scrambling at the start of a project. Very few construction managers realize how much time it takes you to get information, verify it through your own field locations and computations and compute whatever layout they want first.

Scope of Services – Line Items in Sequence

To this point, I've been general about specifics. Now, it's time to get specific about specifics. So just what line items should you specify? I'll share from my own experience. Forgive the many uses of the first personal pronoun. As stated up front in this course, this material is a me-to-you presentation. Where feasible, for the sake of not offending the writing police, the use of I, me, my and mine are avoided, but in some sections, it's unavoidable. And, this is one of them.

Please understand, I don't presume to tell you what to do; instead, I'll share what has worked for me, and thus many "I's" will follow. You decide what elements of my experience are applicable to your own situation. My word processor's grammar-checker will drive me nuts over all these first-person sentences.

The reason I write in this forbidden manner is to make this course more like a seminar you attend in person, where I share my personal experiences with you, so that you can benefit from anything I've learned and apply it or not as you see fit. As in any seminar, some attendees are there simply for the needed credits; others come to learn the easy way what the instructor learned the hard way, and this second group I consider to possess great wisdom. You know who you are. For those readers truly seeking to learn from my experience, I promise to hold nothing back. I've paid dearly to learn some of the 'trade-secrets' and horse-sense in this course, knowledge other professionals may be reluctant to share – and I'll probably tell you some stuff they haven't yet discovered.

How many, how distant, how often and how precise?

My rule of thumb is to specify the minimum layout that I think provides necessary control to guide the specific construction. Stating fees for the minimum necessary layout is important to winning the apples and oranges game.

My proposals specify number of stakes or stake intervals (frequency or distances between stakes), the maximum number of visits to the site allowed in the set-fees for each line item, and in some cases how precise the layout will be.

A closer look at a proposal's typical line items

I normally list my proposal's line items in the same sequence as they'll be ordered by the client. This makes my proposal logical in nature and may flag for the person reviewing the bids some omissions in my competition's proposals.

Contract Line Item #1 – Field Reconnaissance and Preparation of the Geometric Plan

Background for this line item:

This first line item requires discussion, because how you handle it depends on whether you are or are not the record surveyor – or whether you are the surveyor working for the design firm for the project. Other variables we'll cover also impact how you package this line item and how much you actually get paid for your effort, whether you roll it into fees in the overall scope of your proposal or maybe don't get paid at all for it.

So, there are a number of IF-THEN's regarding this first item in your contract. I'll try to make this simple.

But first, what exactly is a Geometric Plan?

Computing the coordinates of points to be staked and preparing a plan drawn to scale based on those coordinates has traditionally been called, "Preparation of a Geometric Plan."

In most cases, *where* the future improvements get physically staked (and built) is dimensionally governed by site development plans or separate layout plans showing the position of such improvements in relation to parcel boundaries. Normally, critical dimensions are shown on the plans of development, and the positions of all improvements constructed are related to those dimensions.

A little history for you youngsters.

The term “Geometric Plan” dates back to the time when site development plans were hand-drawn. Even into the early 1990’s in many regions, during the first phase of a significant project, the boundaries of the parcel under consideration were often drawn with a protractor and scale (or similar method) from deed descriptions. No great care was exercised at this point during this preliminary, feasibility or conceptual design phase of a project to create a truly to-scale map.

Alternate development schemes were sketched on cheap tracing paper (called “onion skin”) and overlaid on the hand-drawn boundary sketch. Often this original base map, created initially for preliminary work, survived unaltered through to the final design. The plan was overlaid and traced to linen or mylar and became a final plan – yet, it was not truly to scale.

Often, no drawings were plotted from coordinate values of the boundary until the time of construction layout computations. Only then were the first to-scale drawings made to facilitate construction layout, and these drawings were called, “Geometric Plans.”

Later in the course, I’ll tell you a true story about the trouble I had on one project in the late 1980’s because the designer never made the effort to create a drawing to scale. I created a Geometric Plan in order to perform construction layout of the project. And, the building didn’t fit on the site as designed. Later for that story.

That was back then, but...

One thing has not changed to this day. Because proposed improvements are dimensioned off property lines as they’re depicted on the design drawings, property corners and the property lines running between property corners serve as computational starting points for most new construction. Parcel boundary markers or monuments are the essential, primary control points in the field the dimensionally relate to the plan of development. These physical objects on the face of the earth control where everything actually gets built. The results of computations to determine this are represented visually on a “Geometric Plan.”

We may generalize then and say that the parcel boundaries or phase lines are dimensional starting points for computing all layout. The record surveyor (the surveyor who performed the boundary survey of the parcel being developed) must be responsible for marking the parcel boundaries – the physical starting points for layout – prior to commencement of construction layout activities.

Don’t delay the start of construction!

Aside from the business promotion/management and liability issues involved in large-project construction layout, the hardest thing is just getting started on a project. As noted elsewhere, the worst time crunches and coordination hassles come at the start of the project – between the time you’re told you’ve been awarded the work and the time your first call for layout comes.

In the next few paragraphs, it’s necessary to address several variables depending on which person you are:

- The licensed surveyor who performed the boundary survey of the parcel being developed
- A licensed surveyor who *didn’t* perform that boundary survey

- The record surveyor who is an employee of the firm that prepared the Site Development Plan
- A layout contractor or engineer (not a licensed surveyor) performing construction layout

This brings us to the IF-THEN's.

The next few paragraphs may require re-reading due to the variables (your role, present and past), and some “if/then's,” (about what boundary evidence or other starting points you recover on the site being developed). Defining these variables helps suggest how you can best navigate the choked logistical waters at the start of any construction layout project.

Variable 1: You are the record surveyor.

If you are the one who surveyed the boundaries of the parcel being developed, you're in a strong position. You've already set primary control points on the site, and you know where the property lines are in relation to those control points used when performing the survey. But, what if the owner did not want property corners set at the time of the survey? They should be set prior to construction as a general rule. You may be confident that you can perform the construction layout without needing corners set, but my advice is, set them. This gives you one last reality-check of your boundary decision as it actually fits on the planet with other site features. And if by some stroke of CADD-luck your control network and your boundary have become disassociated from each other positionally, this may be discovered in setting corners.

It happens in the CADD world that data gets corrupted as control networks and property lines get moved separately in the drawing. While competent CADD operators realize this and take great care to keep the drawing “pure” in this regard, accidents do happen. You need to verify that your control and the property boundaries are still rightly related to each other before you stake for construction. If you think this can't happen to you because you are so very careful, just wait.

Setting missing property corner markers should *not* be part of the construction layout contract, *even if you are the record surveyor and the one performing the construction layout*. The reason for this is that including the monumenting of property corners will not appear in your competitors' bids or proposals. If you know the property corners need to be set, still don't include it in a construction layout bid or contract. Setting corners is not a construction layout activity.

Generally, in my experience, the construction management firm requires the owner or developer to have the primary corners of the parcel or phase lines set or marked in the field prior to construction. The best construction management firms are aware of this need. Then there are the other not-best firms. Often, you will need to prompt the team's awareness of this critical detail.

If you *are* the record surveyor and you've already set the corners in the past, you still must go to the site to verify that your previously set corners and/or control points are still present, undisturbed, and recoverable. If the corner markers do not meet these three conditions, they need to be re-set – but as noted above, generally not as part of the construction layout contract.

The best bet (if you want to get paid for setting corner monumentation) is to have the construction manager require the owner to have the corners set. The owner then calls you, and you establish a fee for that service. Generally, there's a little overlap of services between your

two clients (owner for the sets and construction manager for initial reconnaissance and control work that must precede your actual layout functions), and this overlap represents a financial opportunity for you.

Variable 2: You're not the record surveyor, but you are a licensed surveyor.

If you have the survey map or plat, go to the site to search for evidence of corners. If you find them, you have your starting points – with or without any help from the record surveyor.

If you can't find sufficient evidence of corners, you either have to somehow get the record surveyor to set them; or to provide you with other adequate control data; or you have to do a resurvey before you can start the construction layout. One obvious solution is you doing a survey for free, thus decreasing your income and increasing your liability exposure. Not good. What to do?

Let's hope the person who surveyed the boundary doesn't hate you. If you can obtain that surveyor's coordinates for the corners and his permanent control as well, you're off to a running start. If the surveyor's permanent control points are undisturbed and recoverable, you've got your starting points for your computations and layout work.

Suppose the record surveyor hates you. There's still hope. The record surveyor has an established relationship with the owner (or a former owner) and therefore has an incentive to set the corners at a relatively small fee, since his records research, field survey and computations are essentially completed.

Call your construction layout client and ask your client to contact the owner or developer directly. Give your layout client something in writing that states what you need set at the site. Be sure to require enough for you to feel comfortable that you've got solid starting points for your computations.

Using this approach, you've successfully dodged the liability bullet for anything whatever to do with where the parcel boundaries are located.

The construction manager makes the owner/developer understand that not knowing exactly where the property corners are will delay the start of construction. This gets the owner's immediate attention!

Construction is a blame game. When a project is undeveloped and under construction, the owner/developer is spending money with none coming in. Construction delays are not tolerated.

A fringe benefit for you in handling the need in this manner is that your client will understand the situation and blame the owner (not you) for delaying the start of construction if those property corners don't get set in a timely fashion. If the owner's surveyor is unresponsive or slow to deliver, you are not to blame. You're out of the line of fire. A fringe benefit for your construction layout client is that your client can't be blamed by the owner for delaying the start of the project. You've dodged the first blame-bullet. In the process, you've probably made a good impression on your client through foreseeing a potential problem and bringing it to your client's attention.

After corner markers have been set, you go locate them. Computed positions of the recovered corner markers are your starting points for computations; two corners suffice in theory, but three corners are much, much safer, as any surveyor appreciates.

It bears repeating in this context that if you are *not* the record surveyor (whether or not you're a licensed surveyor), state the assumption in your contract that a minimum of three property corners and two benchmarks shall be established on the site to serve as your starting points for the computations and layout performed under your contract. State that they must be set and flagged a minimum of five business days (or period of your choice) before the first layout can be performed under your contract. This clause gives you time to field-locate and verify those points supplied by some other party and to compute at least enough to get you started.

Two benchmarks, not just one, are needed to be certain the benchmarks' elevations have been correctly posted and to eliminate the possibility of mistaking some other point for the intended benchmark. Checking into the second benchmark confirms the first. Never accept only one benchmark as sufficient vertical control. If the new construction ties into existing utilities, it's a good practice to check inverts or other features just to be sure whoever provided the bench marks didn't mess up. If you catch a mistake like this BEFORE the start of construction, you'll be loved by your client.

Variable 3: You're the record surveyor, AND an employee of the firm that prepared the Site Development Plan for the project.

If this applies to you, then you have a distinct advantage over your competition, because not only are you familiar with the boundary and the on-site control that already exists; you're already in possession of the site development drawing created by the firm you work for. Larger civil engineering firms often have in-house surveying. If you *are* the record surveyor and also employed by the firm providing the site design, you already possess what you need to start your geometric plan.

Namely, these are

- the random control points from the initial existing conditions survey,
- the boundary data and coordinates, and
- your firm's digital design drawings.

In almost all civil engineering firms today, the basis for construction layout is the CADD generated design product. This is usually a "pure" drawing, that is, a to-scale CADD product that incorporates both parcel or phase boundaries and the design elements that will be staked. All this necessary data undoubtedly had your control traverse as the starting point for your property survey. This is one "big firm advantage" noted earlier in this course.

In this case, computations for layout begin with object snaps to and offsets from points or objects in the digital CADD drawing. There may not be any "Field Reconnaissance and Preparation of the Geometric Plan" line item in your proposal at all. Isn't that great?

No. It isn't great because it may look to the person reviewing your bid that you left that line item out by mistake. My suggestion for winning the "Apples and Oranges Game" is that you include

the line item (Reconnaissance and Geometric Plan Preparation) and put “no charge” for the associated fee.

The record surveyor who’s also an employee of the project’s design firm has a distinct advantage over the competition, because this surveyor is the only surveyor who can hit the ground running, with little or no reconnaissance or preparatory computations and checking. Most of the work that a newcomer to the site has to perform before staking anything is in your hand already.

One word of caution: Never forget that the digital product is subject to corruption by those who use or modify it. Too often, the non-surveying employees of large, multi-discipline firms, when working from the surveyors base map, unknowingly disturb the relationship of the CADD image (objects) to the coordinated points developed by the surveyor. A significant movement of the CADD objects (such as a rotation of the graphic elements representing the project, made to “square” the CADD view of the site to the computer screen) will usually announce itself as you begin work with the digital drawing. However, beware of those *small* changes that are not readily apparent on the computer screen. Corruptions of the digital product are commonplace. It’s a reckless act to assume the digital product is dimensionally pure.

Variable 4: You are not a licensed surveyor; you’re an engineer who didn’t prepare the design drawings –or- you’re an unlicensed layout contractor.

Assuming you’re competent at necessary computations and field staking procedures, and that you have equipment needed to service the construction layout need, your situation is almost the same as that of Variable 2 – an obvious exception being that you can’t legally perform a boundary survey yourself. Aside from this limitation, your approach is similar to Variable 2.

Summary Regarding the Geometric Plan Preparation

(We’re still talking about Contract Line Item #1.) Whether or not you’re the record surveyor, and no matter whose digital product you receive, be it from the multi-discipline firm that employs you or an outside source, some time is needed to verify the graphic integrity of the digital data, to field check agreement between physical boundary evidence and control points with the coordinates of the CADD imagery provided, and to make any adjustments needed. You must also determine what points will be held as primary control for the duration of the project and set additional control points in the field at strategic locations. After this, points with N,E & Z coordinates must be assigned to items to be staked, and a certain amount of checking, set-up and uploading of coordinate files to a data collector is always required.

Therefore, my recommendation is that proposals include some fee for “Field Reconnaissance and Preparation of the Geometric Plan.” In all cases and variables discussed above, some cost is associated with this function. At the least, verification of control points set earlier is needed.

A final reminder: If you’re competing with the design engineering firm for the construction layout contract, realize that you have a distinct disadvantage with this first line item. You’re going to spend much more time getting ready for your initial staking.

You may need to spread the costs of work that categorically belong in this line item to other services, to layout items that you stake more efficiently than your primary competitor. If your

firm is a small, responsive, well-oiled machine that knows its stuff, don't be afraid to go head-to-head in competition with any firm for construction layout contracts.

Even though the design engineering firm with in-house surveying seems the likely first choice of the construction manager, and seemingly *should* be for lots of reasons, larger firms are often slow to respond, assign inexperienced crews to providing construction layout and are often disconnected from the heart of the construction need through layers of management. Many of these firms would actually prefer not to do the construction layout. This is the little firm's frequent advantage. There are exceptions, but in general, this is what I've observed.

Item #2 – Stake for Clearing

Now, that the variables of that first layout challenge have been covered, I'll get back to telling you how I approach proposal writing and why.

Usually, the first call from the construction layout client after being awarded a contract is to stake clearing limits.

I want to make an important distinction. There is a difference between writing in your proposal, "Stake Clearing Limits" and "Stake for Clearing." The first might be interpreted to imply more of a role than I wish to assume. My intent is to "stake for clearing," not to assume a role that says, "Thus far and no farther shall ye go." Do you see the difference? Keep reading.

The preservation of trees and wetlands is of ever increasing importance. If the site development plans do not show individual trees, my line item for marking clearing limits reads something like, "Stake for Clearing – as scaled from plans."

This provides some leeway, since scaling is an approximate method. Clearing limits are often not shown with definite dimensions on the plan. Even if I "pick" the coordinates for this layout activity from the CADD file, I'm essentially scaling them, since no dimensional cross-verification is available. If that line has slipped or moved as the result of a CADD mistake, and the plans don't look markedly different (always check this), then I have no ability to verify that the clearing limit is in the right place. Essentially, I am scaling the limits.

If the clearing limits of the design are drawn along the base or top of slopes, without an apparent attempt to save certain trees, then it will be hard for anyone to fault me for the destruction of some significant trees along that line, provided I accurately reproduce the plan's clearing limits on the ground. It is not up to me to determine what vegetation is or is not preserved. My role is to accurately reproduce within reasonable limits the clearing limits drawn on the plan.

However, if a tree survey has been performed or the topo base mapping for the project identifies individual trees, and certain trees are shown in the plans as ones to be preserved, then I assume the responsibility for locating and clearly flagging those individual trees. This can take more time, so I state in my proposal that the tree trunks of trees designated on the plans to be saved will be marked. This implies I don't have to flag the drip line or perform additional measures to protect those trees. That responsibility will hopefully fall to the excavator.

It is beyond the limits of my expertise to protect those trees. My role is to identify them visually. For this function, Item #2 of my proposal will state:

Item #2 – Stake for Clearing and Mark Trees to be Preserved

Item #3 – Topsoil Storage Areas – Quantities Analysis

These services are often not required, do not take very long, vary in required effort to perform and are better off not assigned a fee unless specifically required of all bidders by my client.

If for some reason I elect to note one or both services as line items, the fee is noted as, “To be performed per Table of Hourly Rates.”

If a client insists on a firm number for staking topsoil storage areas, I’ll normally include a line item that reads like this:

Item #3 – Stake 3 Topsoil Storage Areas – 4 stakes at perimeter plus 1 at center \$ n/a

If performed while on-site for other layout services ----- \$###.## --or--

If separate visit to site required to complete ----- \$###.##

Perhaps this is a good time to note that what I fear most in competitive bid situations is a non-thinking, non-analyzing assistant project manager or clerical person sifting through the bids for the lowest-priced construction layout provider. I want that person to slow down and think! My proposal is constructed to stand out because of its appearance and its merit and not be easily reduced to a bottom line. I also don’t want the alternative fees shown above to be mistaken as *two* fees to be slammed into an adding machine. That’s the reason for the generous indent for the alternative fees and the \$ n/a at the right margin. Be careful with the appearance (really, the graphic design) of your proposals.

Want to win the Apples and Oranges game? Don’t make life easy for the mindless, fatigued, or lazy person in the construction manager’s office who’s been told to look through the stack of bids and pick the lowest one for each bid category. Your proposal should appear simple at first glance but defy the wits some gnome at the adding machine. You want your proposal to get before the eyes of a person who understands what sets you apart from the competition. And, if such a person perseveres and just plows through with an adding machine anyway, make your proposal’s right-hand column contain only dollar amounts for absolutely essential layout that you’re certain all competitors will include in their proposals.

Item #4 – Stake for Blasting

I state that staking for blasting will be billed per *Table of Hourly Rates* if requested.

Item #5 – Rough Grade

Rough grading of a site normally takes place after the site has been cleared and grubbed, stumps removed and topsoil stockpiled on-site or trucked off-site. I discuss this function in the pre-bid meeting with the client to determine if all bidders are required to include a fee for this in their proposals. If not, it’s another “*Table of Hourly Rates* if requested” item.

If it is required, I mention in the pre-bid meeting that there are widely varying ways to stake rough grade. I say that rough grade stakes could be set on a grid once the site is cleared, or it can

be a features-based layout where drives, tops and bottoms of significant slopes, building pad and detention basins are staked separately from open areas of the site that get staked on a grid system. I tell my client in this meeting that I don't want to specify a 'full-service' scheme when my competitors figure on a grid system throughout the site, and then some clerical person in the client's office just adds up numbers without seeing the differences in scope of services between the construction layout competitors.

I ask if this person will personally review the construction layout bids to analyze these important differences. This is very important information to know, as you can appreciate. And, if the answer is yes, I've elicited a commitment I can remind this person of later - IF I don't get the award.

If this person indicates what I fear most, that some clerical person goes through the bids and posts a bottom line number to a spreadsheet for the manager, then I state that I will assume a 50' grid system approach throughout the project to not fall prey to my competitors' tactics.

In this case, my line item simply looks like this:

Item #5 – Rough Grade – provide 50' grid. Stakes reference proposed grade ----- \$###.##

If my client is one I've worked with before and have a good working relationship with, that relationship is golden. If I am certain my proposal will be analyzed by discerning eyes, then I may get specific. In this circumstance, my proposal will stand out because it shows my knowledge of what's best for my client that many or most competitor's lack.

Below is the background for how my line item appears in a proposal for such a client.

Open Site Areas and Large Parking Lots

The open areas of a large site as well as large parking lots, bottoms of large detention basins or athletic fields may often be graded by the setting of stakes on a rectangular grid at 50-foot (or greater) intervals. Grid spacing is discussed with my client, agreed upon at the pre-bid meeting, and specified in the proposal.

Retention Areas

Areas for the on-site storage of storm water seldom lend themselves to staking per a grid-scheme because of their rounded shape, steep side slopes and flat bottoms. Normally, I specify X-number of stakes around the top of slope and X-number at the toe of slope at the basin.

Building Slab

If a building is to be constructed slab-on-grade, the slab itself will often need to be staked so that the area can be cut or filled and compacted to precise grades in preparation for construction. This is also something to discuss in the pre-bid meeting with the client and ask what will be required of all bidders. I need to know if a few stakes will do the trick or if I'll have to spend any significant time in addition to the site's rough grade staking for the building itself.

If I'm told a few stakes at the building location will suffice, I state the number of stakes I'll provide in the line item related to the building's rough grade.

If instead I learn that any significant effort will be required, I make this a separate line item, to distinguish the matter from other bidders' proposals.

When I include a separate line item for staking building rough grade, I note in my assumptions that the fee assumes building rough grade will be staked at the same time as site rough grade, and that an additional fee of \$_____ will apply if building rough grade is requested separately from site rough grade staking. If the site is very close to my office, I may omit this qualification. This can be placed in the 'Assumptions' list if it makes the appearance of the proposal too congested.

Number of calls to complete

This may be a good time to mention that I normally limit the number of trips to a site for any line item. This could be noted in the wording of the line item, for example: "Stake water line for construction, assuming completion of initial layout in no more than three calls to the site." However, this usually goes in a separate 'Assumptions' listing so as not to draw undue attention to conditions that may generate additional fees.

With a client who appreciates the thought I put into each individual project and appreciates me for doing so, my line item looks like this:

Item #5 – Stake Rough Grade – assumes FULL-SERVICE layout as discussed

In meeting with so-and-so on [date] ----- \$###.##

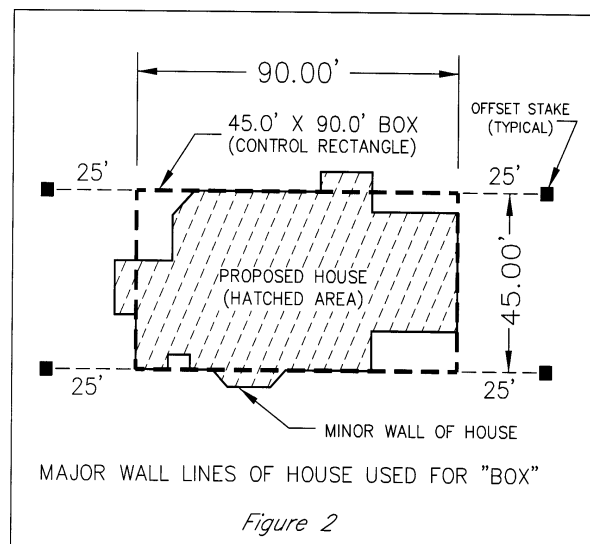
Item #6 – Building(s)

Primary Building Control

Control Rectangle

Often single-family residences and simple commercial buildings having just a few variations from an essentially rectangular footprint require just a "control rectangle" to be staked, normally with just four stakes set. My fee is based on guidance received in the pre-bid meeting, and is so stated in the line item.

Figure 2 shows single offsets from a "box" drawn to dimensions of major, exterior walls, an approach common for single family homes and simple commercial structures.



Double offsets for this house require four more stakes, offset the other way from the corners of the 45' x 90' "box".

The actual staking of the control rectangle and labeling of stakes is discussed in more detail further on in this course in the section on actually staking for column layout. The same principles apply in most respects.

Column Offsets

Some custom residences of significant size and complexity as well as larger commercial buildings normally require more involved layout.

Keep in mind that many of your competitors will assume what is needed without discussing it with their client. You gain an edge through knowing what is expected and specifying exactly what's been discussed. If after such discussions, the client decides on another approach to the layout, it's much less likely the client will try to hold you to the proposal's fee. After all, the client had a hand in misguiding you. It should come as no surprise to the client if you amend your fee to accommodate your client's change of mind.

Staking column offsets and labeling of these stakes is discussed in more detail further on in this course.

Anchor Bolt Checks

Since anchor bolt checking is sometimes required and sometimes not, and sometimes difficult to perform and sometimes easy, and sometimes a report is required and sometimes not, I do not include this in my proposals. Somewhere in my proposal, I may note that anchor bolt checks or wall checks, if required, will be billed at standard hourly rates. It's best not to lock-in a fee for this work.

Elevator Layout

A similar note may be included stating that computations and staking related to elevators, lifts or other building features not specifically listed in the scope of services will be billed at hourly rates if required.

Keep in mind that to stake these, you need current architectural and/or structural plans. Then, you may need to verify numerous dimensions, compute locations in relation to column lines or other controlling dimensions not related to previously computed points within the building. Once computed, you may need to restake your control points that have been destroyed by other building construction or to locate existing columns, walls or holes in upper floors and lay out the elevator from computations made from this as-built data. It's best to always charge hourly fees for this work. When a client orders "just a stake in the middle of the elevator shaft," beware of the word, "just." It could take a long time to stake interior building elements once your original control has been destroyed.

Special Needs and Layout Requests

Once I was asked to find the center of a rectangular room being constructed within a cancer treatment center. The room was made with concrete walls about three feet thick and had only one door. It was presumably to be used for some radiation device. The mission was to mark the

centers of each of the four walls and stake the intersecting point in the floor. Lines marked on the four walls had to intersect at a 90-degree angle.

This may seem easy at first glance, but give it some thought. It wasn't as simple as you might initially think, since the room was not perfectly constructed, and some variation in the lengths of the walls and the angles at the room's four corners was present.

The assignment was not envisioned at the time a proposal was drafted.

Once I had to stake a point on the floor of the world headquarters of a major time-oriented corporation where the sun, shining at noon through a fabricated hole in the roof at the vernal equinox would hit a certain point on the floor, some thirty feet below the hole in the ceiling. Our firm also had to provide an astronomic north reference on the ground for a large Stonehenge type of sculpture to be constructed on the grounds at the site.

You never know what clients and developers can come up with for requests. Be sure they pay you for your part in helping them realize their dreams with a qualification in your proposals that any building layout that differs from that within your proposal will be billed at standard hourly rates.

Upper Floor Projections

Not infrequently, I've been asked to project column lines to upper floors or to provide other control to upper floors of a building. Often this is requested after the original building stakes have been destroyed. This can represent a considerable effort and should not be performed on other than an hourly basis. For this reason, this function is also included in my Assumptions listing as work to be performed per *Table of Hourly Rates* if requested.

Auxiliary Structures & Features

Unless advised to the contrary in the pre-bid meeting, normally the following items are included in the listing of items that will be staked on an hourly basis, only if required.

Containment Structures

Pump Stations or Pump Islands

Detached Garages and Carports

Pools, Bath Houses, Cabanas

Athletic or Recreation Areas

Walks and Trails

Gauge Stations

Switching Stations

Dumpster Pads & Trash Enclosures

Transformer Pads

Site Lighting

Staking for these last three items should only be included in a proposal as line items if specifically requested by the client. I generally leave them off for this reason: Contractors will often locate these themselves from some other staking or construction already in place. If I specify a fee in a line item, I risk that someone reviewing bids in the client's office will include it in what they perceive as my proposal's "bottom line." If my competitors have been silent on the matter, this hurts me in the Apples and Oranges game.

Utilities

Usually the construction of site utilities and the buildings will be happening at the same time. As a rule, the deepest utilities will be constructed ahead of the others.

Sanitary

Because the gravity sanitary sewer system is normally the deepest, it is often constructed first. The horizontal position of sanitary structures is often not super-critical except where the manhole cover must fit in a sidewalk, close to a curb, or there is some other constraint. You may wish to ask your client (usually the site superintendent) or the utility contractor how close the structures need to be staked for horizontal alignment.

Remember, you can't err in being too accurate and precise, but you can in being too sloppy. But, a question worth asking may be, do you need to provide a tack in an offset hub for a sanitary manhole in the middle of a parking lot or one on a line running through the woods? If not, why spend twice as much time achieving precision that is not needed? The average survey crew is worth about \$2 per minute. If your crew saves a half hour by not wasting precision on things that don't matter, you are \$60 richer for their lack of wasted effort.

You need to make your own informed, and hopefully correct, decisions regarding precision and accuracy in staking for construction. I simply want to say that significant money is wasted in needless precision. And, conversely, work performed to less than the needed precision is bad business. Learn to know the difference and count the minutes. Each minute you save is worth about \$2.00. These add up, and they add up quickly.

A word of caution. Sanitary sewer pipes can have very, very flat slopes, often in the order of 4/10 foot (or about 5 inches of fall) in 100 feet. The vertical component in your staking of sanitary sewers is often very, very critical. Don't get sloppy with this!

Storm

Installing storm sewers usually follows construction of sanitary sewers. Again, know what precision is needed. In general, basins along the curbing are more critical for horizontal layout than are manholes. However, don't assume. Make judgments based on experience gained over time and be humble enough to ask contractors and superintendents how precise various kinds of layout need to be. In the end, it will make you far more profitable and competitive than those who never take the trouble to learn what degree of care to put into the various elements. There's

a lot of money to be made in the accumulated minutes not spent in the pursuit of needless precision.

Some regions use elongated concrete troughs precast as part of long rectangular concrete tops for catch basins along curb sections. These troughs vary in length depending on the amount of water the designers expect the basin to collect. For this layout, stakes along the curb line are necessary in order for the contractor to align the base of the structure and its top with the future curb line itself. Both the horizontal and vertical components are quite critical for such layout, as well as the position of the stakes so that excavating equipment can work without destroying the stakes. Be sure to ask what layout is required and where it should be placed for these and any custom structures you're asked to stake. No one ever minded my asking, and most showed appreciation. And, I learned a lot.

Water

Again, ask to learn what is critical. The exact horizontal or vertical position of a water line may not be very critical (but, don't take my word for it), yet some jurisdictions specify a very precise setback of hydrants behind the face-of-curb line. Also, the height of the hydrant base above the curb may be critical. Know what is needed in your area and deliver it.

Electric, Telephone and Cable

Often, underground electric, telephone and cable lines are installed without staking. Normally, I don't include these as line items in my proposals, but place them under Assumptions, in a listing of items I'll stake on an hourly basis if requested.

I recommend discussing this in the pre-bid meeting.

Item #7 – Foundation As-built Survey and Site As-built Survey

My recommendation for non-licensed (as a surveyor) layout providers is that you go silent on these services in your proposal. Often, the owner is responsible for this anyway and not the construction manager or general contractor.

It is good, however to have a relationship with a licensed surveyor who will provide this service for your client, and for you to know ahead of time what the fee for this service will be.

CAUTION! Just be very, very careful not to represent yourself as a provider of services defined in your state as "surveying." If you want to sub-contract licensed surveyors to perform this work under your proposal, get the advice of an attorney familiar with professional licensing in your state who can determine whether or not you can legally do this and, if so, how to go about it. Also, check the fine-print on your contract with your client. It may not permit you to subcontract services offered within your proposal.

Time Elements - Be Unambiguous and Unspecific

Notice Required

I find it beneficial to include in contract language clear yet non-specific clauses regarding time commitments. What? Non-specific contract language? Bear with me – and, of course, check with your lawyer. But, when you do see your lawyer, ask him or her to read this section before laughing me to scorn.

One item I always include covers how much notice should be given when the client calls to order layout services. Notice less than this MAY be deemed, “Emergency Service” at standard rates as attached to the contract. See more on this under, *Include a Table of Hourly Rates*, elsewhere in this course material.

A specific phrase like, “Two full working day’s notice is required when calling to order layout services...” may cause concern on your client’s part, since experience dictates that it is not always possible to foresee some needs two or three days in advance. Generally, a seasoned superintendent can schedule within this time frame, but the construction setting is fluid, ever changing and sometimes unpredictable. A rigid notice requirement may be interpreted to say, “I am unsympathetic to what your life is really like, and I ALWAYS require a minimum notice – no matter what.”

Consider instead something gentler like, “Normally a minimum of two full working days notice shall be given when requesting layout, however a genuine effort will be made to accommodate situations where standard notice cannot be given.”

This softens the tone of the matter without, in my opinion, opening the door to consistent late afternoon calls for layout the following morning.

Why include something so vague in a contract? Aren’t contracts supposed to be specific? The reason I suggest this is, it has worked for me. Such a clause allows me to loosely quote my contract to a superintendent who is consistently ordering work at the last minute.

The real-world complication here is that some superintendents (the ones generally making the calls for layout) are good managers who can look ahead a few days, while others simply are not. One superintendent will consistently give me notice of several days, while another is always calling at the last minute, in frantic need of layout.

I consider that part of my occupation is training those ordering my services to appreciate that I can’t always respond to last minute calls for layout, but that I always try to meet their requests. Sometimes I’ve said, “Gosh Joe, I was able to make it Tuesday in response to your call Monday afternoon, but you know, my contract calls for two full working days notice, and I can’t always put off another client who called two or more days ahead. Tuesday we were lucky, but try to give me more notice next time, so I can better meet your needs.”

I’ll even suggest they call to give me a heads up like, “Hey Jonathan, it looks like I’ll need the parking lot laid out next week; I’ll give you a call when I know better what day I think the prep-work will be ready.”

If I can get them to do this, I've not only made my own scheduling less hectic, but I've helped them to be better managers. If they do this with me, and many have gotten into the habit making such calls, they will probably do it with other sub-contractors. I've made my life easier and helped them to better manage their own work.

Words like “normally” and “generally” and “a genuine effort will be made” or “in most cases” are normally something to avoid in contracts, but in this case putting forth an expectation of what is normal has worked for me better than either locking in on a notice requirement (thereby placing performance requirements on me) or leaving it out (resulting in the client thinking I don't need sufficient notice).

Report Preparation and Checking

You may want to consider stating a minimum period for preparation of Grade Sheets after the field layout is completed and/or for checking your layout back in the office.

If you are marking stakes with grades or other data in the field, you normally need time back at the office either to publish your data or to check what has been marked in the field **BEFORE** construction actually commences.

When you mark grades in the field, chances are your work will be used by the time you drive off the site. But, you don't want to be liable for errors you've made until you have checked your work, made any necessary corrections and notified your client of those changes.

Your contract can be a critical defense against an unjust back-charge in the case where your field-marked data (usually marks on stakes) is used for construction before you've had a reasonable chance to check your work.

Your contract might state something to the effect that a minimum of one full working day following the day you complete stake out of construction will be required to check and verify your field work and publish grade sheets, reports or other written authorization to construct, and that work based on your services that is commenced prior to your written authorization to use such data is done so at the contractor's own discretion and risk. The idea here being that a contractor should not work off cuts and fills you've marked on stakes before you've had time to check your work while back at your office.

Billing and Payment – Time to get specific!

I recommend as noted elsewhere in this material, that if cash flow is important to you, you inquire of your client whether or not their operation has a certain time of month when accounts payable cuts checks. If so, I time my monthly billing to arrive a few days ahead of their paying of invoices, in enough time for the project manager to approve my billing and pass it to their accounts payable department.

This strategy can save me almost a month in some cases. Here's how it works. Suppose my client pays approved invoices once per month on the 25th of each month. I may learn that no matter when I bill, if my invoice arrives in the client's office by the 15th of any month (and my documentation is complete and charges authorized), I can get paid on the 25th and have my

money in hand before the end of the month. But, if checks are cut on the 20th, my invoice arrives too late to be approved and paid in my client's current monthly cycle.

In the above example, knowing my client's cycle, say I bill on the 13th of the month so that my bill is in the project manager's hands by the 15th. Accounts Payable cuts my check on the 25th, and I get paid by the end of the month. But, if I routinely bill on the 20th of the month, the project manager doesn't have time to approve my billing and get it to accounts payable in time for the 25th. I'll get paid the following month on the 25th. In this example, by billing this client one week earlier, I've cut my wait-time to get paid by this client from about six weeks to about two or three weeks.

No matter what convolutions may exist in the chain of payment, I simply state in my contracts that payment is due within 30 days of billing. No client has ever discussed this with me and asked me to change my contract. Some clients substitute their contract for my contract, and in it, they have a different payment arrangement, even the horror-of-horrors: I get paid when *they* get paid! I've accepted this arrangement, but not often. It generally means I'll be paid in 60 to 120 days. That's a long wait for a small business to receive payment.

Collections – Go after payment.

Bottom line: The clients pay when they get ready to pay, or when I pester them into paying. Another bottom line: A personal contact is more likely to get you paid than ANYTHING written. In this context, a phone call is considered a personal contact.

But, before taking a confrontational stance, don't lose sight of the benefit of learning your client's internal cycles. When your contract states you'll be paid within 30 days of billing, that a late fee or interest will be applied or that work may be stopped if payment is not received according to the terms of your contract, then you have cause to call your client's accounting/accounts payable staff when you aren't paid in 30 days and try to work out something with them.

If approached in a business-like way, without ill temper or pushiness, I've found I can cut weeks off the time between billing and payment by simply timing the arrival of my billing at the client's office to fit their monthly payment schedule as noted above.

This may not solve every problem, especially when the delay is because a project manager lets billing sit on his or her desk and get buried under "urgent" matters. Some project managers process billing approvals quickly while others, even managers in the same firm, let this function take a back seat.

What spells the difference to a project manager between an urgent matter and one less important (like my billing)? Often just a phone call. More than once I've called a project manager to say that I've been talking with their accounts payable regarding overdue payment, and they indicate the approval for my billing has not come back to them.

Almost always, some lame excuse is offered. In this case, I say that I understand, but that it's as important to my business to be paid promptly as it is to their business to have me provide layout

in a timely manner. Before the person has a chance to speak, I ask, “Will it be possible for you to pass this to your accounts payable staff today?”

I’ve always received a commitment before I get off the phone. “Sure, Jonathan – if not today, then tomorrow.” I thank them for understanding how important this is to me and let them know I’ll follow up with accounts payable to be sure they’ve received the approval.

On just one occasion, I had to threaten not to service a client until I was paid up to my last billing. I communicated it nicely, with regret at having to consider that action. I expressed my wishes that this one hindrance to a good working relationship could be rectified. I stated that I had done all I could, since I really had no control over their payment function and could do nothing myself to solve the problem short of not servicing the client until I was paid. I reminded them that we had a work-for-pay relationship that was falling down on the “pay” end, and that left me with no further options. In that case, the client changed its ways and devised a way to pay me what was past due and then to keep current (with occasional maintenance from me) in the future.

Does it seem I’ve strayed from the topic of “contracts?” It’s important to include payment terms in the contract and take stock of the leverage gained in doing so. Many talented people fail in business because they lack business skills, and particularly, they lack the courage to first state they must be paid (in a contract), to pursue payment (through billing AND through personal contacts made in the right spirit and with pleasant firmness), and to eventually demand, based simply on reason and business needs, that payment be made.

By including payment terms in your proposals, you have every right to pursue payment for your services according to those terms. If you mention in passing that your contract terms are not being met, you have subtly (and do be subtle) noted that your client is in the wrong, and that you are simply trying to cooperate in finding a solution.

Billing Disputes

You may want to include in your contract a statement to the effect that any billing disputes must be presented in writing within 60 days (or other reasonable time) of the date of your billing in order to be considered valid. Consult with your attorney, of course, but make some provision to hopefully avoid a trumped-up complaint arising as a means to avoid paying you for work performed.

Fee Structure

In the construction world, your client classifies your services as either CONTRACT (set-fee) items, HOURLY charges for certain anticipated services, or rude, unbudgeted surprises called EXTRAS. Always keep in mind, whether drafting your proposal or performing work for your clients, these three terms:

- **Contract** Amounts (services performed for a set-fee, regardless of hours required)
- **Hourly** Fees (work authorized in your contract, to be billed per your hourly rates)

- **Extra** fees (unanticipated work beyond the scope of your contract)

Contract Amounts

In your proposal, many layout services on a typical project are predictable in scope, and you commit to perform complete, one-time layout of those items for a set fee. Your monthly billing for “contract services” is based on percent of completion to date (at the time of billing) for each set-fee line item. Your computation for current billing for layout of any set-fee item is based on the percent completed to date minus prior amounts billed for the particular line item.

For example, if your contract’s set-fee for layout of storm sewer is \$3,000 and you’re half done with that layout at the time of billing, your current fee shown on your monthly statement or invoice for that line item is computed at \$1,500(50% of \$3,000) minus the sum of all previous billing for that particular layout. If the month prior to this current billing, you first billed for this layout at 20% complete, you’ve already billed for \$600, or 20% of \$3,000. If as of your current billing, you’ve completed 50% of the layout, your current billing is \$900. Simple, yes? But, keep in mind that for layout of 10 or 15 items over a period of six to twelve months, you need to track the sums of prior billings for each line item and the current percent of completion.

Unless you own a sophisticated software package for this, I suggest a spreadsheet be constructed for each project (each contract) to track your percent-complete billing for contract items. This automation will greatly reduce your billing time and effort IF you’re careful to check your spreadsheet’s formulas to avoid errors. A portion of a sample spreadsheet might look like the table shown below as *Figure 3*.

PROJECT: VILLAGE SQUARE SHOPPING MALL						
	TOTAL FEE	PER CENT COMPLETE (TO DATE)	PER CENT COMPLETE (MONTH)	MONTHLY BILLING	BILLED TO DATE	REMAINING
STORM SEWER	\$ 3,000.00					
MARCH		0%	0%	\$ -	\$ -	\$ 3,000.00
APRIL		15%	15%	\$ 450.00	\$ 450.00	\$ 2,550.00
MAY		15%	0%	\$ -	\$ 450.00	\$ 2,550.00
JUNE		30%	15%	\$ 450.00	\$ 900.00	\$ 2,100.00
JULY		50%	20%	\$ 600.00	\$ 1,500.00	\$ 1,500.00
AUG		50%	0%	\$ -	\$ 1,500.00	\$ 1,500.00
SEPT		75%	25%	\$ 750.00	\$ 2,250.00	\$ 750.00
OCT		85%	10%	\$ 300.00	\$ 2,550.00	\$ 450.00
NOV		100%	15%	\$ 450.00	\$ 3,000.00	\$ -
DEC		100%	----	----	----	\$ -
SANITARY	\$ 1,750.00					
MARCH		0%	0%	\$ -	\$ -	\$ 1,750.00
APRIL		15%	15%	\$ 262.50	\$ 262.50	\$ 1,487.50
MAY		50%	35%	\$ 612.50	\$ 875.00	\$ 875.00
JUNE		100%	50%	\$ 875.00	\$ 1,750.00	\$ -
JULY		100%	----	----	----	\$ -
AUG		100%	----	----	----	\$ -
SEPT		100%	----	----	----	\$ -
OCT		100%	----	----	----	\$ -
NOV		100%	----	----	----	\$ -
DEC		100%	----	----	----	\$ -

Figure 3

You might then copy this spreadsheet and include it with your billing to make the job of the person who must approve your invoice easier. This may get you paid sooner.

Your spreadsheet must cover the anticipated life of the project. The numbers generated will be calculated through formulas in the spreadsheet, and herein lies both the convenience and the danger in using such a method. The ease in obtaining automated calculations sometimes results in automated errors.

All the cells of the spreadsheet containing formulas should be locked to avoid unintentional overwrites or modifications of formulas. In the spreadsheet of *Figure 3*, only the total fee column and the percent complete to date columns should NOT be locked.

Finally, always look over automated (formula-generated) data to be sure it looks reasonable. An error in a formula within a spreadsheet can cost you and/or embarrass you. A client may wonder, if this firm can't get their billing correct, I wonder if their stakeout data is correct.

Thoroughly test the spreadsheets you create and then save a prototype to be opened and saved as some new name for each project you serve.

Hourly Fees – for impossible to predetermine scope of services

Occasionally, it's impossible to set a definite fee for certain layout activities or items. The amount of layout required or effort to stake these items is simply unknown and unpredictable.

Fees for such work should be noted in your proposal as, "Items to be staked per *Table of Hourly Rates*."

Your client may not like this, any more than you'd like receiving an estimate for reroofing your home that said, "To be billed at our hourly rates." Why would this disturb you? Probably because the roofer is left on his honor to be efficient and diligent in his obligations and to not charge for more hours than actually worked.

In the same way, hourly fees without limit create more problems for your client than contract (fixed fee) amounts. To accurately predict project costs, your client has to put in some fudge-factor for your hourly fees. If you don't know what you will charge, how is your client to know? For this reason, avoid hourly fees on your proposal's standard line items wherever you can, balancing this concern with your apples and oranges game strategy. Define the scope of services as well as you possibly can at your pre-bid meeting, and items with hourly rate fees will naturally be fewer.

You may ask, "What about hourly rates combined with a "not to exceed" ceiling?"

In my opinion, this is attempting to solve a problem with another problem. First, your "not to exceed" number has to be high enough to cover any eventuality. And, this high number may be punched into an adding machine by the person comparing bids. The result is that your bid will be artificially high, and you won't get the contract.

Second, it is no secret that "not to exceed" quotations are usually billed to the maximum amount by many if not most firms. One partner of a fairly large consulting engineering company once said to me, "Oh, don't worry, we'll find a way to bill up to the 'not to exceed' figure." Unfortunately, this practice is common, and it's no secret from your savvy construction management clients. To my remembrance, I've never used not-to-exceed figures on a construction layout contract. Some things are truly impossible to predict and must be billed on an hourly basis.

If you must quote a set fee for work that simply can't be predicted ahead of time, my suggestion is that you provide some minimal scope, well defined and clearly limited, with a fixed fee associated with and limited to that specific scope. Then qualify your quotation with something like, "Work requested in addition to this scope will be billed per our *Table of Hourly Rates*."

This approach could mean the difference between you being awarded the contract or not, and you've not risked that your client will ask for the moon at your low fee, provided your scope of services has well defined limits. At the same time, you've allowed your client to put some number into his cost for the activity, and you've set the stage for negotiation of an additional set fee or compensation at hourly rates when and if additional layout is requested.

As noted elsewhere, items like anchor-bolt checks and similar services that may or may not be requested must necessarily be billed on an hourly basis.

Hourly Fees – Restake

Sometimes your stakes will be destroyed during construction before they've served their purpose. Your contract should state the obvious: Calls for restaking will be performed per our *Table of Hourly Rates*. Nothing more need really be said in your contract, in my experience. All contractors know this hazard exists.

Hourly Fees – Extras

“Extra” is a word to avoid in construction, just like the word “crash” in the airport control tower. An Extra is a cost not expected at the onset of a project, and the construction manager has to find a way to recover the cost from the owner.

This is why you don't want to play the game: “leave it out of the proposal (to keep the bid low) and add it as an extra when I'm asked to lay it out later.” Some folks bid this way, and it's unethical. Be assured, your client will not like you if you play that game.

And, this is why it's so important to meet with your potential client in the pre-bid meeting and discuss the specific project you are bidding on. This pre-bid meeting is discussed fully elsewhere in this course material.

Don't mention the word, “Extra” in your contract. Simply note in your proposal that items requested that are not a part of the proposal will be billed per your *Table of Hourly Rates*. This phrasing should cover extras.

Hourly Fees – Down-time due to delays or site not ready

You may wish to include language to the effect that if you are called to a site that is not ready for the requested layout, an hourly fee will be charged for waiting time and that a minimum charge of two hours in addition to any waiting time will be made in the event the layout cannot be accomplished due to these causes. This decision is yours, first as to whether to include such language and second, whether or not to enforce it.

My usual choice is to include the language in my proposal. Then, when called to the site that isn't ready for staking, I notify my client that I'm waiving this fee for the first occurrence, but that I can't absorb such losses on a continuing basis.

Temper your strict enforcement of this provision with this thought: while you may resent standing around losing money for an hour or two, don't lose sight of the big picture. You may need mercy from this client in the future. Cut them a little slack, and when appropriate, let them know you are not enforcing the terms of your proposal. The Bible says, whatsoever you sow, that shall ye also reap. Sow mercy.

Don't expect to hit your client for a couple of hours of hanging around the site and then not show until a couple of days after the date you've promised you'd lay out something for that client.

Often the construction layout function causes more delays than it absorbs. Don't alienate your client needlessly, but occasionally you find a superintendent so inept that you are repeatedly called to a site that isn't ready for you. A clause in your contract may remedy this situation and help the superintendent to plan ahead better.

Hourly Fees – Emergency (Short Notice) Fees – Overtime/Weekend/Holiday Fees

You may wish to state a percentage in addition to standard hourly rates that applies for Emergency Work, defined somewhere in your fine print as “work ordered giving less than standard notice or requested to be performed outside of normal working hours.”

How do you handle emergency calls or weekend calls for layout for which you’ve committed to “contract” amounts, or set hourly rates? Have your contract specify hourly fees ABOVE normal hourly rates and/or contract fees that will be billed in addition to normal fees for emergency work.

An example: Suppose your “emergency” fee is based on 150% of your standard hourly rate. In other words, if your standard hourly rate is \$100 per hour, your “emergency rate is \$50 per hour above your standard hourly rate. Then, for emergency calls for fixed fee work, you simply bill the fixed fee as usual, based on percentage of completion, but you also bill for time spent on that emergency request at an additional 50% of standard hourly rates.

I strongly advise that a work order be signed for such fees before you do the emergency work. It is amazing how emergencies can vaporize at the mention of the additional fees called for in your contract. On the other hand, time is money to the construction manager. If you supply emergency service, often your client will be grateful and happy to pay a premium for the quick service.

Include a Table of Hourly Rates

Always attach to your proposal or any client’s contract a *Table of Hourly Rates*. If you are not a licensed surveyor, do not use the word, “surveyor” in any of the work classifications. Instead, substitute some non-regulated title such as “Sr. Layout Specialist.” A sample *Table of Hourly Rates* follows:

ACME Surveying and Construction Layout, Inc.*107 Periwinkle Mountain Road**Plitzcreek, AK 00000**888.555.1212*

Proposal for project: _____

Proposal submitted: _____

Table of Hourly Rates – Effective Jan. 1, 2005

<u>Classification:</u>	<u>Hourly Rate</u>
Principal	\$120.00
Senior Surveyor	100.00
Surveyor	80.00
Sr. Technician	70.00
Technician	55.00
Jr. Technician	35.00
2-Person Crew	120.00
3-Person Crew	145.00
Secretarial	35.00

Hourly rates for work performed after December 31, 2005, will increase approximately 3%.

Emergency service (less than 2 working days notice or work requested to be performed outside of regular working hours or on holidays is billed at 1½ times above rates.

2 hours time plus time actually spent on site will be billed for calls to sites that are not ready, resulting in a field crew having to leave and seek reassignment on another project. Significant delays not resulting in the crew leaving the site will be billed at above rates.

Special Equipment

You may want your proposal to state that costs for client-requested special equipment that's not normally carried in a typical survey vehicle will be billed at cost or cost plus a small percentage, and time spent to acquire, rent and transport such equipment will be billed at standard hourly rates.

If you need a boat, an ATV, extension ladder or bucket-truck for some particular project, or traffic closures with costs for signs, cones, barriers, police, etc., you want to have a contractual right to recover these costs. My advice is to use special equipment needs as a basis for additional charges only with prior client approval in writing.

Liability Insurance

It's important to understand the difference between limiting your liability under an insurance policy and limiting it under terms of a contract. To avoid confusion, I'll first discuss insurance. Keep in mind that in addition to not being a lawyer, I'm also not an insurance agent. I recommend you seek the advice of an insurance professional remembering that insurance agents are also sales people. The more investigation you perform by asking around and reading up on these issues, the better equipped you'll be to assess risks and come to your own determination of what level of insurance protection you will purchase, balanced against what level of risk you will assume.

Following this discussion of liability insurance, we'll look at contractual matters that help limit your liability (or limit and discourage unjust 'backcharges' from your client).

Liability Insurance, in my opinion, should not be mentioned in your contract or proposal unless your client has specifically set forth the need to carry certain types of insurance with specified limits. Before you start work on a project, you're often required to furnish proof of having liability insurance to whatever limits the client requires. I've never seen any benefit gained by including this subject your proposal.

Be certain when purchasing liability insurance to inform your agent of the nature of your activities on the construction site. Rates for your activities should not be astonishingly high, as your activity is not likely to injure the persons or property of others. Most other contractors on the construction site are operating equipment that may back over people, or that are lifting heavy loads that could spill, or operating saws or pneumatic tools. To get the best rate, be certain your agent knows you are not involved in any such activities and that your primary work takes place on the ground, not on upper stories where you might drop something on someone. Once agents understand this, they usually find a way to classify construction layout activity in a way that results in manageable premiums.

Your clients will normally require a certificate specifically naming them that verifies your general liability insurance coverage and secures their interests under your policy. Your insurance agent will send this directly to your client at your request.

Errors and Omissions Insurance

Every professional activity brings with it the potential for claims against you based on deficiencies in your work. Usually such deficiencies in surveying work are referred to as “errors and omissions.” Some clients will require you to carry insurance to cover your errors and omissions. In my experience, I’ve not been required to carry this form of insurance.

Many small firms and new firms find the cost of obtaining errors and omissions policies prohibitive. This could possibly limit the clients that will hire you, and may be something you investigate before seeking work from a particular client or spend time writing proposals.

One client who requested I have errors and omissions insurance backed down from the request when I stated that deductibles alone were generally higher than the costs of correcting any errors I could conceivably make, and the premiums were outrageous. If I had such insurance and filed a claim for several thousand dollars above high deductibles, my premiums would skyrocket. So, what was the point of having errors and omissions insurance, I asked. This client backed off.

Backcharges – If you break it, you buy it.

Perhaps the most common form of liability exposure in performing construction layout is through “backcharges.” A backcharge is money your client deducts from your billing to cover costs of fixing errors attributed to your work.

Many competent surveyors shun performing construction layout services for fear of backcharges. For a surveyor, construction layout is essentially “reversing the projector” (running the film backwards). Instead of locating existing features through collection of data and then mapping them, the construction layout specialist is staking features from mapping data or design drawings. What is so hard about that?

The difficulty comes perhaps in not being too good at reading architectural or structural plans, or in not liking mud, dust and a noisy site environment. More importantly, people not acquainted with construction may not know how to make their marking of stakes and their reports clear and unambiguous; they may not know where to place stakes so they’re not in the way of construction. This can be overcome by asking questions and should not deter a competent person from performing construction layout services.

But, the bone-chilling fear so common to those providing construction layout comes primarily from the potential for making mistakes and paying for them. Client's will backcharge you for demolishing work you’ve staked in error and for the costs of reconstructing it in the right place. Generally, you’ll also eat all costs to verify that an actual error was made, that it was really your fault, and of recomputing and restaking corrected control. Yes, this is scary, but nothing worth doing is without some element of risk

Before deciding not to perform construction layout services, consider these points:

- If you are competent and have competent help, construction layout errors will not occur frequently.

- If you are redundant in computing your layout and carefully verify your staking with independent checks at critical points, your errors will be infrequent.
- If you document your work, and it is correct, you will seldom be backcharged unjustly for errors.
- The liability for errors is normally discovered in the course of construction. Once a project is built and occupied, little likelihood exists that any errors will surface. In other words, your liability concerns are generally laid to rest when the owner receives a certificate of occupancy. (Compare this with land surveying statutes that often extend liability for surveying errors to long periods AFTER the error is discovered.)
- Consider the emotional state of your construction layout client compared to the landowner who perceives you've erred and damaged his 'stuff.' The construction manager is constantly dealing with problems. It's a problem solving business. Most construction managers just want the problem solved so things can move on. They are not out for blood as so many landowners are. Landowners can carry a grudge forever and broadcast your inadequacy and incompetence at every social gathering they attend for years on end. Construction managers deal in 3D reality all day, every day. They just want problems and mistakes fixed. Generally, they are not judgmental, vindictive, or mean spirited.
- When you are wrongly accused of making an error, if you calmly defend your innocence through documentation without undue emotionalism, your professional presence under fire will be appreciated. The first thing to do when the call comes saying you've made an error is to immediately gather all the evidence you can about what is wrong and what may have caused it. Then analyze it as if you were not involved in the matter. Be unbiased. Try to find what caused the error, even if it was your doing. Don't triumph over your enemies when you find someone else is to blame. Your turn will come to eat humble pie. This just dessert always tastes bitter to the proud and arrogant.
- If you find you're at fault, readily admit your error and promptly take any corrective action necessary, your client will appreciate your cooperation and readiness to accept blame and responsibility when it's your error. Your client already knows you're human and make mistakes. All the other sub-contractors make errors, too. You'll be appreciated for your honesty and cooperation and remembered as one who refrained from pointing the accusing finger and helped resolve the problem.
- If you take extreme care with large structures, especially buildings, dams, bridges, and retaining walls – the stuff that can cost huge amounts if staked wrong – the other things on site are generally not so costly that they'd bankrupt you if you make a mistake.
- If you document in writing what plans you are working from (dates, plan numbers, change orders, etc.) and you follow your own good sense and suggestions in this course, you can often avoid being held responsible for laying things out from the wrong plan, assuming it's the one you've been provided for the purpose. This matter is covered more deeply elsewhere in this course.

- If you are a surveyor reading this, you know how shocked a landowner is when you discuss your fees. How nice it is, at the end of a typical day of construction layout, when you hand a work order to a superintendent for \$800 to \$1000 and get a ready signature and a sincere thank you. You can come back day after day and get the same response. Try this with your typical landowner who needs your expertise but hates to pay for it! Most construction managers and general contractors know the value of your services and gratefully pay the competent and responsive construction layout specialist. And, they are return customers.

Sure, there is exposure to liability in the form of backcharges. But, a good client will give you contract after contract, year after year and will forgive you the occasional mistake with ease. You may have to pay for your mistake, but you won't be hated for having made one. And, yes, the construction layout realm is fraught with the potential for liability for any errors you make and worse, for errors you didn't make that you unjustly get blamed for making.

The Blame Game – Play to win!

If you've made the errors, you *should* be responsible for the damages. This is only fair. But, what isn't fair is when you're blamed for an error and charged for it without being given opportunity to verify your fault. What isn't fair and sometimes happens is this: Incompetent or lazy subcontractors should notice your obvious mistake before they construct something in error, but they appear to be blind. Or, they should provide a reasonable measure of verification of your data and don't. They just go ahead and construct something in error, then sit back and expect you to bear full blame.

Ah, blame! CONSTRUCTION IS A BLAME GAME! Why? Because we are human. We make mistakes. Many people will not readily admit having made a mistake due to pride, insecurity or fear of retribution from their boss or their client. So, they try to pass off the blame to some innocent party – you!

Most often, it's not be your client, the construction manager, who blames you for things; it's some other subcontractor who either discovers an error or invents your fault to cover their own error.

TRUE STORY – The following is a true story, the moral of which is this: On high-liability work, always provide independent, redundant checks of your work, and document what you've done. The second moral is probably, don't behave as I did – unless you are 100% sure of yourself and maybe a little nuts.

It started as a routine staking of a long narrow building several hundred feet long that was to be a strip shopping center. The footings were poured per my staking, and I was asked to provide “brick points” (nails in the footing to indicate exterior building corners at each of its numerous jogs).

These nails were set in the footings by radial stakeout from two well-preserved, intervisible control points previously set at opposite ends of the proposed building during my first visit to the site, in areas undisturbed by construction. From these two control points, I set the “brick point” nails in the foundation to mark the many jogs in the block wall to be built on this footing. I

checked three or four corners near the middle of the building by setting them from the first occupied point and later turned to them from the second occupied point, thus verifying both the nails just set in the footings and the positional integrity of the two control points in relation to each other.

After radially staking all these “brick points,” I set the total station at a random point in the middle of the building footprint where I could see two property corners, all the brick points and the two primary building control points. From this random point, I located all the aforementioned points.

Then, I measured between the brick point nails with a steel tape to check the future wall distances against the plan dimensions for those walls.

Back at the office, I did a three-point resection to determine coordinates of the new, random point used for the checking. Coordinates were established for all the as-staked locations. Next, I inverted between the theoretical computed locations of wall corners and the as staked, “brick point” positions. This confirmed all points were set correctly. Finally, I drew lines between the set points in the computer and labeled them, checking the wall lengths per the computer-generated labels against the structural and architectural plans, finding agreement for all wall lengths. Everything was tight!

At this point, I must say that I felt a bit foolish at taking such pains to prove my layout correct. Now, I always did make redundant checks, including measuring between the points set, but the additional, random setup and location of points, inverting, etc. was a bit much for me. I accused myself of being anal-retentive for double- and triple checking, against which self-accusation I could make no defense. But, I followed my gut, which seemed to be leading me at the time.

Within a few days, the superintendent at that site called and asked me to come to the site to meet with him and the mason constructing the block walls of the building. He said the mason said I’d laid it out wrong and two walls were about 9 inches off.

During that call, the superintendent verified that the plans I’d staked from were current. This seemed to eliminate the only possible cause for my layout being wrong. Now, it must be said that in every case but this one, I always kept my attitude humble when called to a site because someone found what they thought was an error I’d made. After all, it might have been true, and arrogance is not a winning card to play at such a time. But, I acted out of character this one time, largely due to the excessively redundant and independent proofs I’d intuitively made when staking. There, see? It wasn’t that I was anal-retentive after all – just intuitive!

Frankly, I was excited to get this call saying I’d make a mistake, a call that under most circumstances would make my blood run cold. After verifying that my plans were current, I said to the superintendent with whom I’d built a working relationship by this time, “No, I really don’t need to come to the site; the mason built it wrong.”

There was a moment of silence on the other end of the phone. Then the superintendent said, “Look, I believe you, but the mason is insisting you staked it in error, and I really need you to come out here and meet with us so you can defend your layout.”

I agreed to come to his site the next morning and do some non-urgent staking that I'd planned to do later that week. That way, I wouldn't be contributing free time to the venture.

After working at the site a couple of hours the following morning, I noticed the superintendent and another man looking and pointing at walls near the middle of the building. I took a break from the staking we were doing and strolled over to them, leaving my assistant in the van (a conversion van with drafting area and on-board computer) to do some computations and checking.

The superintendent introduced me to the mason who wasted no time in telling me I'd laid the building brick points out wrong. Without hesitation, I got on my radio and called to my assistant, "Tom, bring me the 10-pound sledge, I'm going to break down a corner of this building."

The superintendent and mason looked at each other in disbelief. The mason asked, "You're going to knock down the wall?"

"Just in this corner," I replied flatly, "I need to show you the nail you've covered with the walls."

In the few minutes it took my assistant to get out of the van and bring the sledge to me, I stooped to the shallow trench that had a thin film of ice over the couple of inches of water covering the footing. I broke the ice with my fist and began scooping water from the corner with very fast motions, trying to get a look at the wall corner in question. I wanted to see if my nail was visible.

Beneath the surface of the water in the trench, I could see my orange paint marking an "L" at each nail. The orange "L" had been spray-painted on the concrete footing at the nails and marked the 90-degree angle the wall took at those points.

Just as my assistant arrived with the sledge, I called to the superintendent and the mason to watch as I scooped water from the trench. "Look!" I said, "There's the orange plastic ring on the ram-set nail." It was poking out, half visible on the **WRONG** side of the concrete block. The masons had placed the wrong edge of the block on the nail as their starting point for that portion of the wall, and the wall was constructed a block-width off.

The mason just stared blankly at the evidence, and the superintendent's face bore a wry smile. He privately admitted later that he enjoyed my theatrical presentation and my threat to break down the wall. Truth is, I would have smashed down the wall to prove my position, for I was a touch angry at being conveniently accused of making the error by a person who was ignorant of the facts and willing to blame anyone in sight.

It hadn't dawned on the mason that two walls offset by a short, perpendicular section joining them together, were about 9" short for one wall and 9" long for the other, the approximate width of a concrete block. Neither did he notice that the short, perpendicular wall he'd constructed between two longer walls was sitting very near the edge of the footing, not closer to the center as was typical.

DON'T TRY THIS AT HOME! I don't know what possessed me to be so rash. Seldom is taking such a posture appropriate. I relate this story because it illustrates several important points:

- Well-documented, redundant checks limit your liability.

- It's important to build relationships with your clients. This particular superintendent enjoyed my unconventional handling of the situation, and I knew he would.
- Expect to be blamed for things that go wrong – things that aren't your fault.
- Be prepared to defend your work with neat and thorough documentation or other proofs.
- If you decide to be cocky, be certain your client will appreciate it. When in doubt, don't! A wise guy is seldom appreciated; a confident yet humble presentation is a safe posture. Know your audience.

Proposal language protects against unjust backcharges

If the matter just related had resulted in a backcharge, and I'd not been given opportunity to verify or disprove the mason's false claim, my proposal states that I'd bear no liability. My proposals anticipate such incidents and attempt to limit my liability for errors that are not my fault.

Not responsible for unreported, undocumented errors

I suggest you include in your proposal that you will not be held responsible for errors that are not reported to you in a timely manner or that you've not been given opportunity to verify.

Will give immediate attention to calls to verify apparent or suspected errors

It states that when notified, I'll give immediate attention to investigate suspected errors and assist in determining the cause of and the party or parties responsible for the error.

Must be shown evidence of fault and given opportunity to verify

It states that I must be supplied with evidence of the fault or error and provided an opportunity to verify the claim.

Wrongly placed construction and stakes or control not to be removed for 24 hours of notice

My proposal states that stakes with bad data or incorrectly set shall not be removed or destroyed prior to my inspection, and that I will not assume responsibility for claims arising from stakes that have been destroyed or disturbed prior to such inspection.

No notice? No backcharge.

My proposal states, "If above notice and opportunity to investigate is not given, it will be assumed that, at the discretion of [client], demolition and reconstruction was performed without recourse to [me]. Let a lawyer advise you on this and craft appropriate language, because this is a critical protection! Without a legally enforceable clause to cover an unjust backcharge, you are defenseless against deductions from your bills that appear 30 or 60 days after some alleged error in your work is discovered.

If construction commences prior to notice to proceed (stakes marked in field)

Sometimes you will be asked to mark cuts and fills on your stakes in the field, rather than return to your office to prepare and check a grade sheet showing that data. This request makes sense from the contractor's point of view. When you provide a grade sheet, the contractor has no grades to work from until receiving that grade sheet and then marking the stakes you've set.

But, your risk increases if you provide cuts and fills marked stakes during the same visit to the site in which you set those stakes. You have no opportunity to verify your data in the office, and you or your crew may mark the stakes incorrectly, even if the math done in the field is correct.

If you elect for the contractor's convenience to mark stakes in the field, it makes sense to provide some time for you to check your work back in the office and only then, to advise the contractor to proceed based on those stakes. You will be held responsible for errors whether or not you check your work. So why take the extra risk?

If the contractor immediately sets to work from stakes marked by you at the time of staking, you should not be responsible for the work you've not had opportunity to check. Therefore, I suggest some proposal language be included to place responsibility for such action on the contractor's or construction manager's shoulders. After all, they are the ones who may decide that the benefits of moving ahead with construction offset their risk in working from your unchecked layout. They have every right to make that decision – so long as they don't hold you liable for the correctness of your unchecked work.

Proposal Language – Summary

Pay the price of a printed form – or don't.

I suggest you carefully craft the standard, limiting and disclaiming language of your proposal, to include generic assumptions: when hourly, extra, or special fees apply, disclaimers, client responsibilities, reference to your *Table of Hourly Rates*, etc.

Take your draft, along with all questions you have, to an attorney. Refine the language and content of the document.

When that is done, put it all in a word processor and format it using small text, say 7 or 8-point text at the largest. Make it fit on one sheet of paper with generous white space around the margins and between the paragraphs. This will become the back side of your printed proposal form for construction layout. When you have something you like the content and looks of, take it to a printer along with your art-work for the mostly blank, front side of your standard proposal form.

Or, since you will probably not use a large quantity of these forms, you may wish to make the form yourself using a word processing or forms program on your computer

For a starting point in your design, check Internet sites that provide standard and custom forms printing. You'll find some ideas to get started. Standard off-the-shelf proposal forms have not worked in my experience for the construction layout business.

Finally, I suggest that you print your proposal forms two-sided. Print the back side using fine print in a readable, gray or screened font, like the contracts you sign regularly in the course of your life. Don't make the print hard to read! Say what you need to say in the fine print concisely and clearly, in everyday language wherever possible. Then, make a standard template or simply a document you open to start your proposals.

When you have a specific proposal to craft, know what you're going to place in the available space on the front of your standard proposal form and enter it on your computer using the template you've pre-designed. When that is printed, turn the paper over and run it through the printer adding the fine print to the back side of the proposal form.

If you have the money and really mean to impress, you can seek the aid of a professional printer to make forms for you, even carbonless, color-coded, and two- or three-part forms. Just make sure the format allows you to stretch to more than one page without the form looking like it's inappropriate for its use.

Remember, your proposal is a contract when countersigned by your client and returned to you. And, we HOPE it has the force of a contract when you are awarded a project based on that proposal. Again, ask your attorney!

You've been awarded the Contract!

What great news! You've been awarded the contract. The question is, whose contract? When you made your proposal, you put great thought into it and paid for legal advice and even took a course in construction layout (this one).

Next thing you know, your client presents you with a contract document to sign, and your proposal is nowhere in sight!

Your Contract or Mine?

So, whose contract is going to prevail? It's a sure thing that the person who drafts any contract is likely to find the terms to his favor. I suppose it depends on how hungry you are for work, how much you trust your client, and how good a negotiator you are, whether or not this is an acceptable situation.

The first thing to determine is whether your proposal is referenced in the contract provided by the client. If your proposal is directly referenced in the new contract, it's a good sign. As always, check with your attorney, but for my money, a contract that references a proposal, legally includes a proposal, so the real questions are:

- Does this new document conflict with the proposal, on what points and to what harm or potential for harm? If in conflict, which prevails?

- Finally, knowing the facts, ask yourself, “Do I really care about the differences between my proposal and this contract I’ve been given to sign?”

If you do, you have some negotiating to do. While construction layout is your livelihood, don’t lose sight of how small your role is in the overall project and its budget. (Remember that little ellipse at the bottom of Figure 1!) If you’re too much of a pain to your potential client, the award may pass to someone easier to deal with.

Negotiate to win.

If you decide to negotiate, know what battles you need to win, if any. During negotiations, whenever possible, make some concessions prior to bringing up the thing(s) you just can’t live with. Then, if you meet with resistance point out how reasonable you’ve been and concisely explain why this matters so much to you. Be sure your attitude is one of working together, not a contest of wills. Seek the common good.

Sometimes you’ll get some verbal assurance like, “Oh, we’d never do that to you. But, we’re stuck with this contract; we can’t deviate from it, or our insurance company (or our lawyer, or our underwriter...) made me do it.”

If you’re willing to live with the risk, you might ask at this point, “OK, Joe. I trust you. May I quote you on that?”

Joe is in a spot now. If he says, “Sure,” you mostly have what you want. If he says, “No, you can’t quote me because I’m a liar,” you have a problem. Of course, he won’t admit he’s a liar, but if he’d never do that, and assures you with his ‘trust me’ look that he’d never do that, then why the heck can’t you quote him? Something is wrong with the picture, wouldn’t you agree?

Suppose Joe offhandedly says sure, you can quote him, then do it! In some unobtrusive way, like an e-mail you request a “read” receipt on, or even a “sent” e-mail you print (which will show time and date sent), you go ahead and quote him.

Your communication says something like this: Per our conversation on the phone today, I’m accepting your contract and want to thank you for this opportunity to serve you on this important project. You’ve stated that [whatever Joe said you can quote him on] even though the written contract stated otherwise. Based on your verbal assurance, I am pleased to be a part of your team and will make every effort to provide your needs on this project.

Make your stab at providing some formal evidence of Joe’s assurances clear, exact and concise and bury it in the middle of blah-blah stuff. I suggest a nice, long paragraph of meaningless drivel with your silver bullet buried deep in the middle. It may not turn the legal tide if push comes to shove, but at least you’ve created evidence that could prove embarrassing should Joe forget his promise, and that might be enough to give you some needed power in any future struggle over this issue. Remember, Joe has no right to lie to you or to make assurances he has no intention of keeping or authority to keep. He has no cause to complain if he’s quoted. You asked him if you could!

Finally, keep this in mind. The simple solution that may avoid any difficult negotiations is to ask if the contract can be amended to simply reference your proposal. Explain that your proposal

says that in the event of conflict between the proposal and any contract to which it is attached or in which it is referenced, the contract terms shall prevail over the proposal. (Of course, your proposal needs to contain such language.)

Point out that because of that clause, the client's standard contract will not lose force. But, because the contract is generic in scope, it doesn't address some concerns that your particular proposal specifies, and these are important to you and to the client. See if this logic flies. If so, probably you can just find a place in the contract where you can write, "This contract incorporates by reference [my] proposal dated ____/____/____." Again as always, ASK YOUR LAWYER.

Pre-construction meeting

Now you've landed a mid-sized commercial, industrial or institutional construction layout contract. (A project of this scope is useful to illustrate conditions found in many smaller and larger assignments.) Congratulations! You've reviewed the bid set of plans, had your Pre-Bid Meeting, refined your scope of services to fit the project and the client, made a Proposal and been awarded the contract. The next thing you want to do is get yourself invited to the Pre-Construction Meeting.

Normally this meeting takes place with many of the subcontractors present. The project schedule is discussed, and in particular, the superintendent or project manager wants to get start date commitments from subcontractors whose work comes early in the construction. For example, demolition may be required on a previously developed site; then clearing, stripping and storage of topsoil, excavation, rough grading, building foundation or footing construction, etc. Did you notice that some of these early functions require your layout? That is why you want to be at this meeting.

And, closely observe your client's employees at this meeting. What are their titles and roles they assume? Get clues about how your client administers the construction oversight function. Who runs the meeting? If the site superintendent takes the lead, it suggests that this person will probably be your main contact throughout the course of the project. If a project manager who'll be functioning from the client's office (not stationed on site) leads the meeting, this suggests you'll have more than one boss. You need to get a feel for how your client's personnel relate and share responsibilities.

Remember the distinction between the expertise of PM & Super

In a construction management firm of significant size, you're likely to find a structure comprised of project managers, assistant project managers and superintendents.

The superintendent is the person stationed on the site, usually in a construction trailer or temporary office. The project manager and assistant project manager may or may not be physically present at the site during construction. It helps to know whom you are meeting with, because your primary communication once the project starts is with the superintendent in most cases. The superintendent, in my experience, is most likely to really know what is needed for

layout. The project manager has many, many administrative duties to perform, project scheduling, monitoring of schedules and budget constraints, dealing with lots and lots of paper work and phone calls. The assistant project manager performs varied duties and may have little or much to do with ordering construction layout. This varies from firm to firm and possibly even from site to site with the same company.

But, for my money, the superintendent is your best bet for finding out specifically what is needed in the way of layout. It is to your advantage to provide the ones actually constructing what they want and need for layout. One of the most common and greatest failings I've observed in people providing construction layout is not asking specifically what is desired for layout.

Generally, at this pre-construction meeting or soon after, you will want to ask at least the following questions:

Cutsheets (Gradesheets) or Marked Stakes?

Ask what layout will require you to mark stakes in the field rather than provide gradesheets. Gradesheets, sometimes called cutsheets, are generally letter-sized pages of rows and columns with data providing the vertical and horizontal relationship between your stakes and the proposed construction. More information about Grade Sheets is included near the end of the course.

What hours site will be available for staking?

Find out when the site will be open for your staking activities. It is common that construction sites are fenced and locked when the construction manager or superintendent is not present. In many areas, the construction activities start at 7:00 in the morning or earlier and end promptly at 3:30 in the afternoon. Surveying and engineering companies often don't start work until 8:00 in the morning, and survey crews won't leave the office (to head for the coffee shop) until later than that. It best for client relations and most cost-effective to make your crews' work hours coincide with those of your construction layout clients.

Will there be a full-time on-site superintendent?

This is important, assuming your client is the firm employing the superintendent. Some construction management firms spread a single superintendent across multiple projects. This makes it difficult for you to get direction and work approval. You should obtain pager and cell phone numbers for the superintendent, so that you can coordinate or ask questions as needed. You should also arrange verbal authorization for your work in the event the superintendent is not available to sign work orders. Write a letter of send an e-mail to your client stating that you were authorized by so-and-so to accept verbal instructions plus authorization for work by phone. Ask that they notify you in writing if that should change. Be sure to write the name of the person who approved or ordered layout plus the date and time of the approval on your work order.

Will there be any on-site layout staff and equipment?

Occasionally, you will be providing primary control from which your client will perform the bulk of the staking. A simple example of this is when you provide a control rectangle for a

single-family residence, and the contractor actually stakes all the jogs in the home from your four stakes.

On a commercial site, the degree of control you provide can vary greatly. A client may rely on you entirely for at least “ground level” control. Other times, you will provide minimal control to be supplemented by your client or sub-contractors.

In some instances, you will provide most control, but the client’s personnel will come behind you and check your work. Typically, the person checking your work will be a young graduate of some construction management program who is high on theory and light on experience. This can create a special problem for you, especially when this person is equipped with better equipment than you possess. A true story related later will illustrate this.

Ask in your pre-construction meeting whether the client will have its own layout personnel present on the site to perform either supplemental layout or checking. If so, you may wish to inquire who will actually be doing that work and what equipment will be employed.

Bid-set of Plans still current?

Sometimes, the plan set you used for bidding is not current at the time of groundbreaking. Be absolutely certain to verify that the bid-set is current or to obtain a current set of plans.

And, e-mail or send a memo stating that you’ve been informed that such-and-such a plan set or sets is current (stating the latest revision date of the plans) and that you will use them for all layout unless directed otherwise by your client.

Communication

Ask lots of questions—preceded by personal statements

Questions are manipulative devices. They seldom reveal the reason they’re being asked. Consider, for example, those times when the boss comes over and asks, “How long will it take you to finish that?” You don’t know why you’re being asked this. Is the boss upset at how long it’s taking or does the boss simply want to know when you’ll be looking for your next assignment?

What if a detective knocks on your door and asks, “Where were you on the night of October 9th?” Don’t you want to know WHY you’re being asked that question?

Questions put the person asked at a disadvantage. Questions you ask put you in control of the other person. Questions therefore make people uncomfortable – subconsciously if not consciously. Questions you ask another demand information from that other person, but don’t reveal why you’re asking.

Is mine the most recent plan?

Consider the difference between asking a site superintendent “What’s the most recent site plan?” or, saying instead, “I’ll be staking the curbing west of the building today and want to be certain

I'm staking from the most recent plan. Mine is dated October 9th of this year. Could you confirm that this is the correct plan to stake from?"

Which do you think is going to be better received by the superintendent? Did you notice I just manipulated your thinking? Did you mind? There, I just did it again!

Not only are you providing the superintendent with better information in the second approach noted above, you're likely to get a considered answer and an accurate one, not just a tossed off answer.

Seldom will the construction managers mind your interruption if they realize it's for a good reason. Briefly explaining your reasons for asking shows respect for their busy lives, helping them know why you're taking up their time and redirecting their activity with your questions. Also, you are many times more likely to get an answer that truly addresses your need.

Where will the site remain undisturbed until this staking is no longer needed? Where is the best place for our control to be set?

Having ascertained that you are working off the most recent plan, your next effort is to find out WHERE you should set your stakes so they have the best chance to outlive their usefulness.

What points do you want referenced?

The site superintendent knows what should be referenced: a column line or a building corner, the center of a catch basin or the point where a line through the center of the basin intersects the face of curbing along the street.

How do you want the stakes marked?

Should the stake note a cut to the bottom of curb at the gutter line or top of curb? Should the offset be to the gutter or back of curb? Be very careful with your computations if you are asked to show cuts to the gutter grade, but the plans show proposed top of curb spot elevations.

And, ALWAYS mark your stakes and label your grade sheets CLEARLY as to what horizontal and vertical points your cuts and fills are referencing!

Once, a surveyor I knew almost bought an entire, newly constructed street because his crew marked the offset stakes, "2' O/S BACK CURB," meaning behind the face of curb. The contractor took the stake to mean, "two foot offset to the *back* of the curb," not to the *face* of the curb as the surveyor intended. What do you think got constructed? The result was a road got constructed one foot too narrow to conform to the town's standard, that is, two times the width of the curb. The town decided to accept the street anyway, and the surveyor got to keep his house and his business. This was a narrow escape that might have bankrupted the surveyor if the town had been rigid. What caused this crisis? The surveyor's crew marked the stakes in a manner that made his intent unclear to the contractor. The devil is in the details.

Will you need Grade Sheets?

Grade Sheets (also called, “Cut Sheets”) allow more careful review of the control you've provided to the contractor than stakes you mark in the field. Grade Sheets are safer and generally preferred over just marking cuts and fills on stakes when they're set in the field, as discussed earlier. When using Grade Sheets, construction can't begin until you've checked and delivered them. If you leave stakes in the field with cuts and fills marked on them, construction often starts from the marked stakes – before you've had a chance to check your work back in the office.

If you marked grades on the stakes, ask when will the actual construction begin?

If you've provided cuts and fills marked on stakes, the danger is that construction may begin immediately and not allow you time to correct mistakes. Also, if pressed by too much work to complete in too short a time or by a budget that is in bad shape on the construction layout project, you may elect to not check the layout notes at all. (A very bad idea.) But, if you're delivering cutsheets, you'll have opportunity to rethink the layout provided, and you're therefore more likely to discover errors before anything is built.

For this reason, when marking cuts and fills on stakes set in the field, ask when construction will begin using those stakes and state that you have not checked your work yet. Any work started before you've “signed off” on the marked stakes is at the risk of the client. At least, as noted earlier, your proposal should note this point in its disclaimers. Advise your client to either not start until you've notified that the stakes are correct or to assume the risk of working from unchecked work.

Are you expecting any activities today that will block our line of sight?

If you explain where you expect to be working, often the superintendent will run interference for you, getting areas cleared of obstructions to your sight lines, and tell subcontractors to keep the area open for you.

What are acceptable tolerances for this particular layout?

Want to make money? Lay it out as accurately as necessary, not as accurately as possible. Document the stated, acceptable tolerances on your work order and get it signed. (Work Orders are specifically discussed near the end of this course. Their use is introduced throughout this material.)

Is there any “dead” equipment on site that cannot be moved if it's in the way?

On a site jammed with equipment, stockpiles and storage areas, you may have trouble seeing necessary lines of sight. It's helpful to know if certain pieces of equipment in the vicinity of your

work can or can't be moved. If you see a concrete truck in your area of work, ask how long the activity is expected to continue.

What's the name of the equipment operator?

If you notice that a piece of active equipment will be getting in your way, find out the operators name. When you approach this individual later and ask that something be moved, address the person by name. It'll make a difference in that person's response to you if you know his name.

If our work runs late, will we be able to stay to complete it?

Some sites will be locked and inaccessible after a certain time. Most construction sites I'm familiar with operate generally between 7:00 and 3:30. Some sites lock their gates at 3:30. If you have a half hour to finish at 3:30, too bad. Come back in the morning. On other sites, I've finished by flashlight and locked the gate on my way out. The superintendent allowed us to lock up when we were finished. It pays to know which applies to you and if there is any flexibility available.

Who will sign our work order today and will that person be available all day?

A work order signed by the superintendent (or other authorized client employee) prevents most future disputes over hourly, re-stake or extra charges. For this reason, it's important to have your work order signed at the end of each day that you perform layout at your client's site.

At projects where the superintendent is not always present on the site, it's best to ask if another authorized individual will be there to sign it. If that's not possible, at least get the superintendent to sign authorization for your work during this conversation. Write on the face of your work order, "Work authorized by _____" and have the superintendent sign there. A signature there doesn't necessarily approve the hours you end up spending, but at least the client's request for the work is documented. Most often, this will suffice to get you paid without a struggle.

This signature (or some authorization in writing) is critical protection for you. At the end of the day, note your hours on the work order for any work performed other than set-fee work, and leave a copy in the superintendent's office if possible.

If the work you've performed is for set-fee items of your proposal, the hours you spend at such tasks need not be stated on the work order. For set-fee layout, your fees for any given month are based on percentage of completion for each such item at the end of your monthly billing cycle.

Imagine your client trying to remember what you did on any particular day a couple of weeks back in order to authorize that work if no work order was made and signed. But, a copy of a signed work order immediately ends all uncertainty. An ounce of prevention...

You are only *one* of the experts. Stay in your place.

In communications with others on the site, especially with your client, recognize that they are experts in their field, as you are in yours. Don't forget your place in the overall picture is

proportionally quite small. This point is restated often throughout this course for a reason: it needs to be.

Expect to learn

You'll be ever learning in the construction environment. It has its own vocabulary and its unique culture. In many ways, it will be refreshing to deal with practical people if you've been cooped up with engineering-folk. In the construction world, you're dealing with people whose job it is to solve problems and get the thing built. Construction managers are the last people to handle the project's design and the ones who know how it goes together – often better than the designers do. Designers can be anal-retentive, and they're often in their profession precisely because they are. Construction managers can't afford to indulge pointlessness; they need to move forward. They're often a delight to be around, because they're problem solvers, doers and facilitators, not finger pointers. Listen well and learn.

Discuss your intentions

When you arrive on the site to perform layout services, BRIEFLY tell the superintendent what you intend to do. I'm not speaking of a long, drawn-out explanation of your processes, but a general and concise statement of your plan of action. You either will have to get his blessing or be instructed in a better way. Either result is highly beneficial. Later in this course, different approaches to laying out various proposed construction is discussed in more detail. For now, it is enough to say don't just set about your work without discussing what you are about to do with the superintendent.

In my experience, surveyors and engineers often arrive on a site and set about doing what they *think* is needed. And, often this is not what's really wanted. Offsets may get staked on the wrong side of the work for the convenience of other needs. Offset distances may be too far away for convenient use or too close to work around when constructing. Discuss your intentions before staking.

Know your contract and assignment

It can't be said too often: Know your contract; know what you're being asked to do; and know if it's in your contract as a set-fee item or as an hourly-charge item.

If your contract is specific enough about the work requested, and you or your crew know what is and is not a part of that contract, then work requested that exceeds what you've committed to provide must be charged as an "extra" or made a gift to your client.

Any last minute "Oh, while you're here, could you please..." request is legitimate as long as it is in your contract and you have the time to do it without compromising another client's previously ordered and scheduled requests.

Be prepared for Extra Work

Be sure you and your crew(s) know how to respond to requests that are outside the scope of your contract. Always, always have blank work orders with you in your vehicle, and get your client used to signing them, even for contract work. When the extra work requests are made, your client will be used to your appearing with the work order to be signed before you start the work.

Memorize names and titles

Know to whom you are speaking, and tell your crews to do the same. Never permit your crew to come back at the end of the day and say, “A guy on the site asked us to stake the dumpster pad, so we did it.”

You or your crew **MUST** know the name of anyone requesting work and that person’s title. Some sub-contractor may be requesting the work – a person who has no business relationship with you and either thinks you are there to serve any site needs (at someone else’s expense) or is sly enough try for some free work.

If you are not personally on site, your crew **MUST** know what is and is not in the contract; what is a set-fee item; what is an extra-fee (not in contract) work request; and how to handle each type of service provided.

No work authorization? No work.

If you and your crews follow a policy to get **ALL** work authorized with a signed work order, even your proposal’s set-fee items, then it is much easier to get the on-site superintendent (or other client representative) to sign your work orders for hourly or extra work items.

And, don’t do even contract work that is requested by someone other than your client. For example, if the building contractor asks you to stake the elevator shaft, and it’s in your contract to perform that layout, don’t do it without a signed work order from your client.

All subcontractors will understand that you do not have a contract with them if you mention this fact. When a subcontractor asks you to perform layout services not in your contract with your client, it is always a winning strategy to say, “Will your firm be paying for this, or is [name of your client] paying for it?”

As soon as they say your client will be paying, you say something like, “Sure, I’ll be happy to do what you’ve asked. I just need to get a signed work order from my client to authorize this work. The best thing is for us to walk over to the site office together so you can ask [my client] to authorize this work.” If that subcontractor is trying to ‘sneak one in,’ they’ll find some excuse to put off that encounter with your client.

Educate your crews and require their compliance

Never allow the crew to take direction from someone or discuss the mission with a person whose name, employer and position they didn’t write down and can’t remember. “The fat, red-haired guy” is not a name! **WRITE THE NAME DOWN.**

Train, train and train. The average field crew, especially one used to performing boundary surveying and land surveying functions, can’t be function as adequate business representatives unless you train them to faithfully represent your business interests and follow your policies on the construction site.

If you are normally available by phone, a safe policy is for your crews to always call you in the presence of the person requesting any work other than what you’ve sent them to the site to perform. This, of course, requires that you either provide your crews with cell phones or have your crew’s permission to use their private cell phones for this purpose. In this case, your

training is easier. You simply instruct your crews to call you the minute someone asks for layout you didn't anticipate when you sent them to the site.

Some crew chiefs are generous souls, who will give away the shop. Some are cantankerous individuals who will not represent you well in negotiations. Occasionally, you find an employee who handles business and client relations well and can be relied upon to represent your interests. The party chief who does this well stands out.

Know your personnel and fit your direction and instruction to the person. Educate them in what you expect from them with regard to client relations and business decisions. This aspect of construction layout is often overlooked by supervisors who are used to overseeing primarily land surveying assignments. A crew performing traditional land surveying work almost never gets into contract or money discussions with your clients while on site. The leader of your construction layout crew will frequently represent you and your business interests. It pays to train them for this.

Finally, all junior members of your crews need to know that the rule is, "Never, never dialogue or discuss the work with someone on site. ALWAYS refer conversations to the senior member of the crew or the supervisor in the office."

Explain to your crews that this is not a flexible policy. It is the Rule, and it must not be violated. Be sure your employees know that it's not a reflection on any person. It's a policy recognizing that the business relationship with clients is always conducted by the most senior person present, and many times will need to be referred to the office. Often even the superintendent (who should know better) will approach the closest member of the crew and negotiate as though this person is authorized to make business decisions. Drill junior crew members to say, "I'd like to help you, but you really need to talk to [the crew chief or my office] about that."

Train the junior members not to answer questions even when they know the answer. They should say something like, "Come with me, and let me introduce you to the party chief. He (or she) can answer any questions you may have."

Your crew chief needs to be told to not allow discussions related to the work between his or her subordinates and the client or contractors. There is considerable liability in your work, and any inadvertent miscommunication, lack of necessary communication or confusion can backfire on you with horrific consequences!

Job Folder – Take it each time

The job or project folder, or at least a field folder for the project, should be taken to the site with each visit. In a small business, when you're generally the one actually going to the field, take the entire job folder with you to every assignment.

In larger firms, or when both field and office functions are taking place simultaneously on the same project (or when you have a crew chief prone to losing things), create a field folder that contains everything that may be needed in the field. Make copies of items that go in both field and office folders. It may be prudent to have a self-inking 'FIELD COPY' stamp made to avoid confusion.

Color-coded Folders

I always use colored folders for each project, and these go in an accordion (expanding) project folder. This makes it much easier to recover or properly file paper work. My color scheme is logical (once explained), and easy to remember. Personally, I don't know why the entire world of business hasn't discovered the benefits of using colored folders. I think my medical/dental providers have though. I see many colors in their racks of patient files, and I suspect those colors mean something.

But, in engineering/surveying firms, perhaps due to our bland personalities, we typically see just those manila folders – those dull, boring, creamy-yellow folders stuffed with filed and misfiled white papers.

Manila and white. How often have you cursed manila and white? Isn't it a pain to deal with job folders, especially for very large projects? Wouldn't it be nice (and worth a very slight, extra expense) to open a job folder and be guided directly to the stuff you need?

Consider color! Colored folders can let you know at a glance, without even reading the scribble on the little tabs, what's in them. Why stop there?!? Colored paper, when used consistently for just one category, classification, or type of business activity, announces instantly what manner of record it is.

Here's my color-coding scheme for construction layout projects:

Blue – “Contract” or “Proposal” folder

The terms, contract and proposal will be used interchangeably in this discussion. A signed proposal returned to you is a contract.

I keep the contract, and little else, in a blue folder. It's always just a few seconds away, available for ready and easy reference, and it **MUST** be reviewed with every call for layout and before every trip to the site. You absolutely must know if what you are being asked to stake is what you've agreed to stake for a set fee, for hourly fees or work that's being requested in addition to what you've agreed to perform. I recommend that you always check the contract either as the call comes for layout or immediately after you hang up the phone. Check to see if you have an agreement for the work you are being asked to do. If not, get one before you do the work.

And, quibbling about it when you arrive on the site is a not a good idea. By the time you arrive on the site, your service is needed right then. If authorization is needed beyond the normal, it can take time. This delays the project and generally means you have to scramble to rearrange your own schedule. And, you've lost at least a couple hours of billable time to regroup and go to another site if the work you've been asked to do is not authorized. Worse yet, you've probably offended your client in the process.

If you have several projects, especially serving different clients, your contracts will vary on significant points. One client may rely on you for partial layout, while another has you lay out almost everything on the site. One client wants offsets to sanitary sewer lines at 50-foot intervals, and another wants only manholes staked with double offsets. Or, perhaps a project manager told you in the pre-bid meeting to bid based on providing a four-point control rectangle for the

building, but the superintendent has just ordered column layout with offsets. In this case, no one has authorized column layout. Are you going to do it for the fee you quoted for a four-point control rectangle?

Make frequent reference to your contract. And, by the way, did you notice in the last paragraph how important written notes taken at your pre-bid meeting with the project manager become? Imagine the power position you are in when you call the PM and say, “Hi Jim. I have a question about how to proceed on your Bedrock Bank and Trust project. Maybe you can help me out. My notes made during our meeting on June 16th, as we discussed how to structure my proposal, you said I should base my fees on providing a control rectangle for the building layout, and that your subcontractor would take it from there. But, I just received a call from your superintendent asking that I stake column lines, which of course is more intense layout than you suggested. Could you look into this and find out if I should do what your superintendent asked as an extra fee or stick to the control rectangle approach per my proposal?”

By having a conversation log from that meeting and keeping your contract close at hand and easily retrievable, you’ve disarmed a bad situation in a matter of minutes and placed the ball in your client’s court, where it rightly belongs. (Conversation Logs are discussed in detail shortly.) You’ve helped your client avoid an embarrassing situation. Otherwise, months down the road he would discover that the building contractor was contractually obligated to provide the layout you were asked to perform. This kind of mistake happens often; it’s uncomfortable for everyone involved; it strains good relationships, and it’s avoidable.

Sometimes you’re buried in work when the calls for layout come. After a few minutes of digging through manila and white and not finding the contract (because it was misfiled in manila and white the last time you looked at it), you just schedule the work, expecting to check the contract when you find it sometime later. Later never comes, and you do the work only to discover at billing time that you have no agreement for the services. This places you in a very, very weak position.

Red – “Billing/Work Orders” folder

Red folders are great for your billing and as a place to keep your work orders not yet billed. Why red? If you aren’t paid, your business will STOP. (Red means negative money amounts, which means stop.) Also, if you have plenty of work, your billing will be done late at night, when your eyes are red. Your clients will see red if you don’t provide documentation of authorizations for extra work. Red is great for billing.

Yellow – “Written Correspondence – Non E-mail” folder

I don’t know how to say it any other way. Correspondence is a pisser (yellow). Usually in the construction layout business, you don’t get paid for your time spent corresponding, documenting and CYA’ing. Therefore, all my correspondence is filed in yellow folders except printouts of e-mail correspondence. With the advent of e-mail came large volumes of sort-of-written correspondence. Filing of this is covered shortly. I don’t put e-mail in my yellow folders.

Much success in the construction layout business is due to covering your a__ with correspondence. You don’t *make* money with correspondence; you *keep* money through it.

Your gently and discretely phrased correspondence and documentation is taken by your client perhaps as over-zealous attention to detail (typical of surveying personalities) when you create and distribute your paper trail. But, should the time come when you and your client are at odds, the client will remember that you're a person who documents EVERYTHING, and if you say you have documentation of a phone call or a conversation or a direction given or a promise made, you mean it!

Never forget that wonderful saying, "The most faded ink has better memory than the sharpest of minds."

In a well-run construction layout business with competent people performing the layout, functioning within a consistent system of checks and redundancy, you'll seldom get into contentions with your clients. BUT... when you do, a good offence is the best defense. Your offence is your paper trails and documentation. These are easily retrievable, so you can quote dates and specifics, if they are filed in your yellow folders.

Yes, folders – plural. A very small business might get by with one yellow folder per project. Probably, you'll be better served by having more than one.

Yellow – “Transmittals & Cover Letters” folder

I suggest a separate folder for Transmittal Letters and Cover Letters plus a spreadsheet-format log of supplementary data or information you receive from others, like plans, change orders, supplementary sketches, etc. This spreadsheet is a hand-written record of ANY sketches, plans or documents I receive that impact, clarify or change the work I perform on the project.

For example, if I'm at a construction site, and a superintendent gives me a copy of a sketch clarifying some missing dimensions on a structural plan, as soon as I get back to the office, that sketch is stamped with the date received and is filed with my plans. Often this new sketch is taped directly onto the old plan or bound into the plan set, and a bold notation in red at the affected area of the plan indicates the area of revision and references this sketch. Notations about the sketch go on the spreadsheet.

Copies of any digital drawings I may have or coordinate files are saved with their original name followed by the word “old” and the present date, and the digital files are then updated to reflect the sketch's impact. A note is added to the digital file to document the date and source of the change.

Now, that takes care of filing the sketch, noting its impact on the original paper plans and modifying the digital files. But, a hand-to-hand transmittal has taken place and plans updated which has not been documented in my correspondence files. Since no transmittal letter accompanied this sketch, a record of it goes on a form in the yellow transmittal file folder. This simple form is placed in the front of my folder to record receipt of the sketch and all other plan revisions, revised details, etc. The form (Figure 4) is shown next:

and know what you did in response to its impact. Of course, you will preface your comments with, “Well, let’s see. My records show that on (date), Joe Marber, your superintendent, gave me a sketch clarifying structural dimensions. We modified our plans per that sketch prior to staking.”

You found your record of that in seconds – no call back required, no fumbling through plans or waiting for the crew to return with them; no digging through heaps of manila and white. Instead, you went straight to your yellow folder marked “Transmittals,” ignoring all other colors, and lifted out your simple form always kept at the front of that folder.

Do you have any idea how seldom your client finds anyone as organized as yourself? You’ll be noticed and remembered.

Orange – “E-mail”

If ever a category of correspondence deserved its own color, it’s e-mail! In my list of “technology that has compromised our quality of life,” e-mail ranks just beneath those pre-recorded telemarketing calls received during the dinner hour.

It’s amazing how e-mail has revolutionized society! In a few short years the young among us will not believe that before e-mail the subject lines of memos reflected the content of the memos – back in the days before the SEND and REPLY buttons existed; back when written communications were less frequent and more meaningful.

Instead of e-mail, back in the dark ages, envelopes were addressed and stamps licked, and people walked to the post office, or at least to the mailbox. Folks sometimes spoke to each other on the phone using real words, or occasionally even in person. Those who received these old-fashioned communications thought them important, and written communications were actually filed in project folders.

But, how times have changed! The lazy folks among us (not you or I, of course) can avoid having to place an e-mail address in the TO box by simply hitting the REPLY button, over and over and over, long after the subject line has lost all relevance to the body of the e-mail. So now, we have countless back-and-forth e-mails on evolving and differing subjects, all bearing the original subject line. Each e-mail must be read or at least scanned to learn the true nature of its content when this happens.

PLEASE, PLEASE, DON’T OVERUSE THE REPLY BUTTON! When you do reply to an e-mail, your communication should truly be a reply, not new business. Always make the subject line of e-mails announce what the e-mail is about. If you use the REPLY button to avoid the need to enter the recipient’s address, at least modify the subject line to fit the content of the new message.

Break the cycle! Create NEW e-mails whenever the subject matter changes. Hit the REPLY button only when actually replying to the matter in the subject line of an e-mail you’ve received. This way, the subject line will always reflect the content.

OK, OK! I admit it; we’ve hit a nerve in my pet-peeve funny bone. (Perhaps you noticed.) But, there’s a point to this tirade, maybe two points, namely:

- E-mail communications create special filing considerations not present in simpler times.

- E-mails are prolific and a royal pain in the filing system.

Should you print out *every* e-mail and file the paper copy? I say yes. At least in the construction layout business. If you generate or receive a lot of e-mail correspondence, it may be beneficial to use two e-mail folders for each project, one for the “not likely to ever be needed again” and one “for possible future reference.”

For example, suppose you have a large project and receive regular e-mail communications from your client on a variety of matters. In this case, you may wish to create separate e-mail files for scope issues, financial issues, ‘unfinished business’ issues, for questions that haven’t been answered (“out-due-back”) and the like. You might even need a TO DO e-mail folder so as not to lose sight of them. The possibilities are limitless, and herein lies the problem. So, beware! You could end up with something worse to manage than the confusion of having all the e-mails filed together in one folder.

Here’s the approach I use:

What to do with an e-mail that pertains specifically to billing? I file it in the red billing folder, not with general e-mail correspondence in the orange e-mail folder. How about an e-mail that modifies the contract? Attach it to the contract (filed in the blue folder) and maybe put a copy in the red billing folder, if billing is impacted. This copy serves as a reminder when billing time comes around.

What if a single e-mail from your client asks for clarification on last months billing and also instructs about tells you what offset distances to use for the building staking? Make three copies. File one copy of it in the red folder for billing and a second copy in the blue, contracts folder, since the specific services to be provided are always, by nature, “contract” matters. In this case, I’d not file the third copy with general e-mail correspondence, but I’d be sure to staple it to the copy of the contract kept in the field folder. When instructing the crew about the building staking assignment, I’d refer to that e-mail in their field folder.

E-mails that don’t fit nicely into any primary category generally just go in a catch-all, e-mail folder.

Finally, the reason I don’t just make a directory folder or folders in the computer’s e-mail program (probably a subdirectory such as “INBOX\projectname\...”) is that I can yellow hi-lite the important matters in the printed e-mails and make multiple copies to file in different folders.

How about saving some e-mails in the computer and others in paper folders? I’ve found that saving some in the computer and others on paper copies leaves me never knowing where to look for them later. For my money, printouts of e-mails work best – IF logically filed.

Classification – the KEY to learning!

A teacher once said, “Classification is the key to learning.”

Classification is also the key to keeping your non-billable, overhead, and administrative costs under control. This section of the course is all about classification. By classifying your paperwork, and filing accordingly you accomplish several things:

Specific items are easy to find, even in large project files.

- Communications are more effective because they are not lost and forgotten. Classifying clearly when filing also makes paths in your memory, and less is forgotten.

- When the phone rings and you need to refer to a specific piece of correspondence, to your contract or previous billing, the relevant pieces of paper are at your fingertips in seconds.
- Frustration is reduced. You don't have to flip through page after page of items having nothing whatever to do with the thing you are trying to locate. Who among us doesn't hate large files full of everything under the sun? It's time-consuming, aggravating and wasteful to search through disorganized filing systems.

And so, classification is the key. Most people under-classify, simply because they have never developed their step-back-and-look-at-the-whole-picture skills. Most business activities fall into a few, routine classifications if you think about it. On the other hand, over-classification tips the scales, and you begin to lose what you've gained through classification. If there are too many filing options, it becomes confusing as to which place is appropriate for a given piece of correspondence.

Green – "Conversation Logs" folder

I have pads of conversation logs made from a form of my own design printed on light green paper. In the green folder is a pad of these blank green forms along with all my filled-out Conversation Logs, torn off the pad and filed sequentially by date. This folder is not likely to become overly full, and you may ask why this isn't included with other correspondence in a yellow folder. Good question.

In the field, ANY conversations that provide direction or in any way could POSSIBLY need to be recalled in the future at a moment's notice are logged and filed in this folder. Any similar phone conversations are documented on the green form and filed. Crews are instructed to make a written log of any such conversations and are required to do this – absolutely no excuses are accepted for not doing so.

If these green, written records of conversations are ever misfiled, their green color will announce their presence in the wrong folder.

Because the conversation log green folder is seldom a large file, and since conversation logs are not mixed into files bursting with transmittal forms, e-mails, memos and such, they are instantly available. In the office, whenever the phone rings, a pad of blank conversation logs is nearby. Any verbal instruction or specific discussion related to a project is documented on a Conversation Log and placed in the project's green folder.

What is so important about this? Check the divorce rate. What does it tell you? Among other difficult realities in life, we must accept that human communication is full of misunderstanding and confusion. Our memory of what we've promised or been promised is flexible, forgetful and sometimes dishonest, even among friends.

When on the phone with a client, I've quickly located some conversation log that relates to our conversation. It was instantly recognizable by the sheet's unique color in my project files. Many, many times my part in a conversation has gone something like this:

"Yes, Joe, give me a second to find my... oh yes, here it is. Joe, I'm looking at my conversation log dated last Monday at 3:10 PM. Pete Quarsby of your office told Ken Fiddler, party chief, and I quote, 'Don't bother to lay out the dumpster pad. We will pull off the building and transformer pad and locate it ourselves.'"

In EVERY case, and there have been many – some of which might have led to disputes and hard feelings – the person on the other end of the phone offered no resistance to my report based on a conversation log that I read over the phone. I can't remember ever being asked to furnish a copy of the conversation log. Conversation logs frequently avert difficult situations, and always I've been able to locate the needed conversation log in a matter of seconds, usually while making some small talk as I locate it like, "Let me get my Conversation Log from my file, Tim. While I do, tell me, what's it like being a new father?"

In a few seconds, I have the paper in hand and scan it for what I'm after. Then, when Tim has finished bragging on his new baby I say, "Ah, yes. Here it is Tim. I'm holding a conversation log of my phone call with Jim Simmons on Friday, October 19th at 10:15AM in which he said, and I quote, 'We will authorize the staking of the dumpster pad as an extra.'"

It pays to know what is going on in your client's life – and to care. I really do care about my client, and a new baby or grandchild is important to my client. Therefore, at times like the one above, I always have something to ask so the other person is talking while I search my files. It pays to document your conversations and verbal instructions and agreements. But, it isn't enough to have the documentation "somewhere" in your files. Timing is everything! You are most convincing right at that moment when the problem is revealing itself. Be able to instantly pull your green Conversation Log from the green file folder and quote directly from it.

You may ask, if the file folder is green, why go to the trouble to make the conversation logs on green paper. If a conversation log should be misfiled, it will yell, "Green, green," at you from wherever it is located. It's visible, even when misfiled.

If you've never tried color-coding in this way or to this degree, its power will amaze you.

Figure 5a

A more complex form is shown below:

DAY: S M Tu W Th F S		Jon Terry Assoc. — CONVERSATION LOG	
DATE: ____ / ____ / ____		PROJECT No. _____	
TIME: ____ : ____ AM PM		PROJ. NAME: _____	
LOG BY: _____		_____	
<input type="checkbox"/> INCOMING <input type="checkbox"/> OUTGOING <input type="checkbox"/> FACE-TO-FACE <input type="checkbox"/> VM		Regarding: _____ _____ _____ Date of Service: ____ / ____ / ____ Purchase Order # _____ Cross Ref: _____ _____	
<input type="checkbox"/> NEW WORK <input type="checkbox"/> PROPOSAL <input type="checkbox"/> NEGOTIATION <input type="checkbox"/> \$\$\$			
<input type="checkbox"/> EXIST. PROJ. <input type="checkbox"/> CHG. SCOPE / EXTRA <input type="checkbox"/> INSTRUCTIONS			
Company: _____			
Phone #: _____			
Spoke with: _____			
Position/Dept./Title: _____			
Direct Phone or Extn: _____			
Menu, etc: _____			
<div style="border: 1px solid black; padding: 2px; display: inline-block;"><u>DISCUSSED:</u></div>			
<input type="checkbox"/> Continued on reverse			
<div style="border: 1px solid black; padding: 2px; display: inline-block;"><u>FOLLOW-UP REQUIRED:</u></div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"><u>RESOLVED / IMPACTS:</u></div>	<div style="border: 1px solid black; height: 100px; width: 50px; margin: 0 auto;"></div>	
<input type="checkbox"/> Continued on reverse	<input type="checkbox"/> Continued on reverse		

Figure 5b

Need more colors?

Colored folders come in other colors (like purple and pastel colors), should your needs for color-coded folders exceed the examples above. Of course, the truly less important filing can always be stored in standard, manila folders.

The filing philosophy

My filing philosophy is this, and it's an important principle:

Create standard, *major* filing categories common to all projects of a given type (such as the system being discussed here). Once these primary categories are established, create additional folders *only* as dictated by how confusing your primary folders become with all that stuff in them.

Any filing system is made for man, not man for the filing system. Don't let the tail wag the dog. Make classification your faithful servant, but don't become the slave of over-classification. Your filing system must always remain your servant. It serves a critical purpose: allowing you to quickly find what you need.

If you under-classify, what you try to find is always mixed up with other stuff that's nothing like what you're looking for. If you over classify, you can never be sure which folder contains what you're looking for. If you classify appropriately, you always know in what folder you'll find what you're looking for. There is a bit of an art to this, and it requires stepping back from the daily grind and reflecting on your overall business activities. But, the rewards are in gaining a sense of control over the tyranny of paper work and administrative tasks.

Imaging that you're in a difficult conversation with your client Your credibility and maybe some money or even future work for this client is on the line, there's a big difference between you calling back after you've finally found what you're looking for and finding what you're after in a matter of seconds, enabling you to make an immediate response during that same phone call.

Having documentation at your fingertips for ready retrieval is your reward. Classify to that end, and with that purpose always in mind.

The scheme above has served me very, very well. I urge you to adapt it to suit your business; try it and see for yourself how freeing it is before you label me as anal-retentive!

Safety

Keep an eyeball in the back of your head

Have eyes in the back of your head. Know what's around you on the construction site. With all the noise that abounds on the site, keep tuned for the telltale signs and signals of change that alerts you to danger.

Vibrations on the ground (often causing the cross-hairs in the instrument to jiggle or your feet to tingle) may signal equipment approaching. Turn around frequently and reassess the dangers.

Be alert and stay alert; and stress to your crew the need to stay alert. Don't allow yourself or your crew to turn their backs on any potentially dangerous situation. Most situations are fluid on construction sites, and conditions can change radically in a matter of seconds.

Generally, when staking, the instrument person is facing the person setting stakes and visa versa. When facing each other and concentrating on your interactions, you are least able pay attention to any dangers behind your back. At such times, you are responsible for watching the other person's back and sounding the alarm when danger is present. Never, never joke about a danger or scare the other person for 'fun.' It could cost a life if your partner thinks you're kidding when you shout a word of true warning.

Take this seriously!

Mark your territory

Set orange cones around your instrument to mark your territory. Keep equipment from getting too close to your setup. Even if your safety is not threatened by equipment coming close to your instrument, it may disturb the setup. Don't hog the tight space existing on most construction sites, but don't be shy about protecting your turf. You need room to work and room to be safe while doing it.

Look for potential dangers. Think in what ifs. For example, if your instrument is set up along side a tall row of construction materials that block a clear view of you from the other side, keep in mind that someone may push or load that material from the other side, and push it over on you or even run you over.

In just such a situation, I narrowly escaped probable death. I was running the total station when a tractor trailer loaded with huge rolls of reinforcing pulled on site and parked such that the mid-point of the trailer was a few feet from my back. The driver unsecured his load and headed for the office trailer, presumably to speak with the superintendent.

A forklift approached the truck on the opposite side from me. It was a noisy site, so I didn't hear it, and my view of the forklift was blocked by the trailer and its load. The forklift operator couldn't see me and didn't know how close to the edge of the trailer that roll of steel was. As he slid his forks under the roll on his side of the trailer, he pushed the roll on my side toward the edge of the trailer on my side. I heard the screeching noise of the steel on the bed of the trailer, turned and saw the roll coming toward me at the same instant I heard over my radio, "Run. Run!" I instinctively grabbed the instrument (not the wisest move) and ran from the trailer as the roll of steel mesh teetered at the edge of the trailer and then fell where I'd been standing.

If you must work alongside any stack of materials, before setting up your instrument set a row of guard stakes on the other side of the pile with flagging running between them. An equipment operator on the other side of the pile from where you are working must at least stop to consider before knocking the pile over on you.

An instrument or backsight left unattended on a construction site is equipment at risk of being destroyed. Mark as vividly as possible around your pieces of equipment. If you or your equipment will be in the vicinity of machinery in use, step up to its operator and respectfully ask if your equipment and personnel will be safe in that area and if the operator will be able to safely work around it. Most operators see this as a courtesy and are proud to personally assure you of their ability to protect your stuff. They are, in the process of agreeing to look out for your investment, bragging on their skill at controlling their machinery. Usually, they'll like you for asking and involving them in the responsibility. By involving them in your concerns, they may tell you about a truckload of something coming into the area where you'll be working later in the morning, and you'll be much better off knowing this ahead of time.

Skillful operators sometimes show off.

While on the topic of equipment operators, let me be a bit redundant with another portion of this course. I've found it's important to set witness-stakes an adequate distance around primary control points. Have you ever returned to a site to see your control still in place, with black tire marks along the side of a hub? Or have you planned your layout from a particular control point only to arrive on the site and see the control point you intended to occupy along with its guard stake sitting on a tuft of undisturbed ground that's one foot in diameter and five feet high?

Equipment operators are often very, very skillful. They can brush the edge of your hub without destroying it or cut around your control point, leaving it standing five feet high on a finger of original earth pointing skyward. Of course, it's impossible to set an instrument over it, but it's there!

Equipment operators sometimes "preserve" your points while making them useless at the same time. Give important stakes a wide berth with extra guard stakes and flagging. Not only is your control point important to maintain; it's also necessary that you have room to occupy and work around it.

Cages in the van

Have you ever seen what a SUV-type vehicle loaded with survey equipment looks like after hitting a tree at 35 miles per hour? I've seen tripod legs that penetrated through the back of the front seat. Pick-up trucks with an unprotected rear window are not much better, because the rear end of a vehicle that hits an object while moving forward jumps upward at the moment of impact, lifting equipment off the floor and shooting it through the back window. I just don't know why so many survey firms fail to install "cages" to keep equipment in place in the event of a collision. If it's within your power to make this modification to your vehicles, do it. Cages save lives. There is no excuse not to have them.

Never go beyond what you're trained for

For years, before I knew better, I climbed into manholes to get pipe sizes and inverts. Now, I do know better. If you're not trained and equipped for any situation of risk, don't risk it. When it comes to hazardous waste sites or entering confined spaces, get the training and equipment or just don't do it. Sacrificing your life is noble for some causes. Gathering whatever information is

in some manhole is not a cause worth risking your life over. Many have died because they underestimated the danger.

The strange dichotomy - People in the most dangerous jobs often value life the least.

Risk-takers take risks. It's an immutable principle. Often, people employed in risky occupations, enjoy the risks involved. The bustling construction site is an environment of risk. Be aware that the people working around you may not be as careful with your life as you are. Expect the unexpected, and do your best to not let others take risks with your life. If a crane operator thinks it's grand to pass a piece of steel over your head, you may want to move to another location until the risk has passed. You're not a steelworker after all.

Speaking of that, if a superintendent asks you to walk steel beams to check their elevations over a few columns, offer him the rod. Seriously, speaking of walking beams, while staking the driveway to a custom home under construction, a superintendent asked me to check the top of steel beam elevations. These beams were about 10 feet above the ground below and only about 6 inches wide. Because there was no advance notice of this request, I didn't have a ladder with me. A young assistant with me that day said he'd have no problem walking those beams. I stupidly allowed him to head out onto the beams.

As he headed off across a beam about four inches wide, my heart was in my mouth. I realized I'd made a mistake. But, fate smiled on me that day. I was more than impressed with the skill of this young man. He could have made more money, I'm sure, as a tightrope walker in the circus than on a survey crew. He walked those beams as casually as I walk a sidewalk. He did the job and didn't fall. To the superintendent I was a hero. (Or maybe it was my assistant.) My boss heard of this, and the hero-status was short lived. I deserved the dressing down I got for allowing an employee to walk those beams.

Know what you're expected to wear on the construction site

Some sites are very lax regarding safety gear. On one site, you'll be thrown off if not wearing a hardhat and safety goggles, while at the next site, nobody on the site is wearing them – even those people at risk that should be out of common sense.

Hardhats

If the site's posted as a hardhat area, but nobody on the site is wearing them, my advice is wear one anyway.

What kind of hardhat should you buy? I'm so glad you asked. Most people who don't know better think, "A hardhat is a hardhat." Ah, not so! Why do people hate wearing hardhats? Because they don't have the *right* hardhat.

A *good* hardhat adjusts to different head sizes with the twist of a knob. This type of suspension mechanism is, to my taste, the best, most comfortable choice for this essential piece of

equipment. On windy days, you twist that adjustment knob to make the hat stay put. Similarly, when you're leaning over something with your head upside down to mark a point, a twist of the knob tightens the hat so it doesn't fall down from where you're working. Another twist relaxes its grip on your head for stand-up work. You may wear a helmet liner some cold morning to keep warm and remove it later in the day when the sun is high in the sky. Just a twist changes the headband size to accommodate this change. If you've never worn a hardhat with such an adjuster, you just have to try it.

How about hardhat color? White reflects the sun's rays and is noticeably cooler in hot weather. To some degree, a dark hardhat will be warmer in cooler climates. One hat may not be enough to suit all occasions.

Some hardhats have a wide brim on the front, baseball-cap style, and must be worn backwards so as not to hit and disturb the instrument when looking through its scope. Some have a brim all the way around like a pith helmet. This is my favorite style, because it protects the tops of my ears and to some degree the back of my neck from sunburn. It tips backward on my head when looking through the instrument's scope. This pith helmet style is a little harder to find than the more common, front-brim style.

Attachments to keep you cool are available for hardhats. Hardhats with your favorite NFL team logo are available. An eagle and American flag design is, too.

Safety Glasses

Most sites I've been on do not require the use of safety glasses. One site superintendent did tell me not to come back without safety glasses that wrapped around the side of the eye. I wear tri-focals. These are a pain when operating the instrument. With most instruments, I have to take them off to get a useful field of vision through the scope. Can you imagine trying to operate an instrument with safety glasses over tri-focals.

For most surveying or construction layout activities, safety glasses are of questionable benefit. Even so, I'd recommend that you have them with you. Sometimes, the superintendent knows that someone will be on the site that day looking at safety issues. In that case, wear them for the sake of the client.

Superintendents are normally very reasonable and understanding people. If you explain that you have to take safety glasses off every time you look through the scope, and that you'll be taking them on and off all day long, generally the superintendent will agree to not require the instrument operator wear them.

Boots

One day, a superintendent told me that I'd not be allowed back on the site with my new-hire assistant dressed in shorts and running shoes. This was the lad's first day of employment, and I'd neglected to instruct him on what to wear to work.

Driving back to the office at the end of the day, I told my new employee he needed to wear work boots and long pants the next day. He said he didn't own any boots.

I said he'd have to buy work boots that night and wear them to work the next day. I explained that the superintendent would throw us off the site if he weren't dressed appropriately. Wearing work boots was a requirement of the client, not an option. And, it was altogether appropriate attire. I apologized for not telling him earlier, so he'd have what he needed to start work.

He said he didn't have the money to buy boots. I told him I'd be happy to advance him the funds.

"No, that's OK," he replied.

He never came back to work. Was it I, the work we do, or the boots?

Safety Vests

Safety is of primary concern no matter what type of surveying services are performed. When surveying in the woods during the fall season, safety vests may keep you from being shot by hunters. The same vest may prevent your being run over when working in the middle of the road. That vest can also save you from being crushed at a construction site or struck by some object hanging from a crane. Don't think that because you and your crew are off the road and not in the woods, that wearing a safety vest is unnecessary. Being visible on the construction site is critical to your safety.

In the warmer climates, a bright orange tee shirt or other vibrant color may suffice. A similarly-colored jacket is a possibility in the cooler seasons.

While safety is the primary consideration, being easily spotted is something that makes the work flow more smoothly. How many times each day does the instrument person have to "find" the person doing the staking? It is so much easier when that person is clearly visible and distinguishable from the foreground, background and other workers.

Ear Plugs

Some site locations are simply too loud to safely occupy without earplugs. These come in a variety of designs. They are cheap. Decades ago, I operated a chain saw for a few hours without ear protection. Since that day, when things get really quiet I hear ringing in my ears instead of blessed silence. I'm pretty much used to it, but as I write this and call attention to it, the ringing in my ears is louder than the whirring of my computer and a fan operating in the room.

Ear protection is perhaps the most neglected area of safety typically ignored by construction layout crews. Earplugs are so very inexpensive.

Sure, you need to communicate with crewmembers when performing construction layout. Earplugs don't prohibit this, although a little extra effort may be required.

My favorite style is a pair on a strap that allows them to be inserted or worn within easy reach hung around the neck. The actual part inserted that I like best looks like a triple-decker mushroom. The "stem" is used to push the three-tiered, sound-deadening portion into the ear.

I love the sounds of silence. I lost that for the rest of my life from just a short time of sound-abuse decades back. Enough said?

Know your equipment operators

Lull or Crane?

A “Lull” is a front-end loading, fork-lift-type thing with large rubber tires. It’s the brand or make of a piece of equipment used often by masonry contractors to lift tubs of mortar and pallets of blocks/bricks up to the scaffold where masons are constructing walls. Other trades use them to lift lumber, steel, sheetrock and other materials to upper floors. I don’t know what it is about the Lulls and their operators, but I’ve learned to fear them. Almost always, these machines are traveling too fast and too close for safety.

Often, Lull operators are junior, entry-level laborers who seem to like speed, and they appear oblivious to common courtesy and consideration of others.

On more than one occasion, I’ve had to tell them to slow down around my crew and me or I’ll report them to the superintendent and ask that they be removed from the site.

Then there are the crane operators. The bigger the crane, the more skillful the operators seem to be. They are wonderful. They know exactly where their equipment is and what it’s doing. I usually feel safe around cranes. One word of caution, though: often crane operators are being directed by someone who can see the load, someone who’s communicating by hand-signals and/or radio with the crane operator. This person, not the crane operator is truly directing the crane’s operation. If this is the case, be certain the person giving the crane operator directions can see you and knows you are there. This is another good example of why you should wear your bright and visible colors.

If you are on a large site, huge dump trucks or vehicles that scrape earth into their bellies may be moving fill from one location to another. These off-road monsters can really move! They not only speed, but they usually cause huge dust storms that billow in their wakes and cover you and your equipment with dust. These are harder to control without the authority of the superintendent, because their operators are passing you at speed, they are usually a rougher cut of individual, and they are frankly on a mission – to move earth quickly. Normally, if the situation is unsafe or unbearable, I will tell the superintendent that I can’t work under the circumstances and ask for suggestions. Sometimes the superintendent will tell the excavation contractor to use an alternate route while the construction layout activity is taking place.

Daring or Caring?

Whether operators are daring or caring, skillful or willful, is something I try to determine each day on each site for each, individual operator. Some operators I turn my back on confidently; others I carefully observe when they get anywhere near me. It isn’t hard to spot the different temperaments, dispositions and aptitude levels “behind the wheel” of construction equipment.

Demon or Guardian Angel at the helm?

Some equipment operators seem possessed. Others are like mothers with babies, caring for the welfare of others. Get to know the signals and learn to tell them apart. Your life could depend upon it.

Know your blasting signals (AND your blaster)

What is that air horn? It doesn't sound like a steam engine or a truck.

If you see drilling rigs preparing for blasting activities, approach the people involved in the activity and ask when they expect to blast, how far away you need to be, what the warning sounds will be and how long between the warning horn and the explosion. This is important information. Sometimes, when the charge goes off, the earth appears to inhale and rumble and rise like a belly full of air. Other times rocks fly in the air and land some distance from the blast site.

These blasting folks know what to expect, and so should you. It is frustrating to have five minutes left on a setup and go running when the blasting is still ten minutes off. The reverse is worse. In my experience, the blasters don't do baby sitting. You are expected to know the signals and head for the hills. You may have to choose between closing out your backsight and saving you backside.

Trust your instincts & your intuition

Finally, regarding safety (and probably everything else in life), TRUST YOUR INTUITION. If you feel concern, don't put it down without investigation. In some cases, when intuition is accompanied by a sense of urgency, just act on it. In time, you develop instincts suited to your environment. Construction sites are dynamic, changing, challenging environments. I think they're fun! But, stay alert. Stay alive.

Downtime Activities

On-the-Road

I once had a silly fantasy. Actually, I had it more than once as a teenager. In it, I had a job for a mattress and bedding store. My job was to crawl into a bed at the front of the store – you know, that showcase area of the store where people on the sidewalk can look through the glass and see a sampling of whatever the merchant thinks will draw people into the store.

Anyway, I would sleep there, in a bed in the showcase, and demonstrate how wonderful that mattress was. I'd actually be paid just for sleeping! The lazy-bug in me was quite captivated with that fantasy. What a silly idea. Someone paying me to sleep?

Some survey crews traveling to distant sites think they're being paid to sleep. I strongly disagree with this unindustrious notion. Do your crews think time spent traveling is "time-off work" for anyone not actually doing the driving? Enlighten them!

Does the field book need indexing for that day or prior days' work? Are there notes to be reduced, sketches to be made, cut sheets to be started? Are tack balls loaded with tacks? If space in the vehicle allows, are there stakes that could have flagging tied on them? Some firms have a policy that the party chief doesn't drive the vehicle. This is based on the assumption the party chief will review the file or set up the data collector or perform some other necessary function on the way to the job site. (Can't you hear the groans and the excuses forming?)

Persons riding in the vehicle are on the payroll and need to know they're expected to work at something – anything – that needs to be done, anything that *can* be done on the road. Sure, there may be times when there is really nothing productive that can be accomplished while riding a half-hour or more to the job site. But, when the crew comes to the point of viewing habitual nap times as a regular fringe benefit and arrives on the site without opening the job in the data collector, getting the paper field book set up, finding the list of available point numbers, looking at the plans or records to get a feel for how to approach the work, reviewing the scope and contract – well that's just plain lazy. Excuse me!?! Is there something odd in this philosophy? Does the term “work ethic” have meaning anymore? Has it become a bad word? Has goofing-off become noble?

Working in New York City near the former site of the World Trade Center, we were making a level-run between benchmarks. I set a turning point right next to a van parked at the curb. While the instrument person advanced to the next setup, I glanced over my shoulder, which was nearly touching the van's right-side mirror, and looked inside. The driver was sound asleep with his head tilted back against the drivers-door window, mouth hanging open and chest gently rising and falling, as he drew in long, deep, peaceful breaths. Lying across the bench seat behind the driver was another person, also sound asleep. My immediate thought was that they must be surveyors, and a sympathetic tinge of shame passed through me for our profession.

You can imagine my initial relief when I stepped back from the van to read the logo painted on its side and saw in huge letters, NYPD.

It may not be easy to build a team of workers who take their work seriously in a society that has lost its bearings, when those in power use their position to get out of responsibilities instead of to set good examples – but it's worth the effort to try. Truth is not a flexible commodity, though it's often ignored. Ethics, including the ‘work ethic’ once considered good and honorable, don't change either, since ethical standards rest on the foundation of Truth. Truth never changes with the times. And, there is still something in many people that *wants* to be inspired.

Sleeping when there's work to be done, when being paid to work, is just plain wrong. Get this across to the crews; inspire them to nobler pursuits if you can; and furnish a sample list of what can be done when riding to and from the site.

Between assignments or during bad weather

There are days when there's simply no project to go to or when it's raining or snowing outside. In those occasional lulls between calls for layout, or during inclement weather, managers often think it's unprofitable to get bogged down with unbillable, administrative time. Think again.

Time that's *unbillable*, needn't be *unprofitable*. Remember, profit is a bottom-line word, not necessarily a word to describe the task being performed at a given moment. Some unbillable tasks *must* be performed as a housekeeping function of any business. No amount of careful management can eliminate such tasks.

However, what is subject to the control of wise management is WHEN these tasks are performed. Profits increase if these chores are saved for between-job times or for days of inclement weather.

When the billable project workload is heavy, this is not the time to be adjusting equipment or making a trip to the mill for stakes. Crews standing around with hands in pockets during down-times is equally senseless. Equipment should be checked and adjusted not on a fixed date, like the first Monday of every month, but on a flexible schedule. For example, some firms perform the check-and-adjust-equipment function on the first bad-weather day of the month, but not more often than every three weeks, unless the equipment declares its need before that time.

A list of chores to be completed during down-times should be posted in a place where crews congregate. The crew members should be told to review that list during any and all significant down-times and to perform something on the list or come to a supervisor and ask for work when everything on the list is completed. Certain personnel should be the ones "qualified" for certain tasks such as equipment adjustment. Obviously, you don't want the new-hire adjusting the cross hairs of the total station.

Here is a starter-list of chores to be done during down-times:

- filing and indexing of records, maps, field books and such
- cleaning out/washing/servicing survey vehicles
- servicing of survey vehicles (Quick-lube establishments or tire and muffler shops can probably perform routine service without advance scheduling. It's raining and the truck is due for an oil change? Why have it out of service on some sunny day?)
- organizing, updating the inventory of consumables
- ordering consumables (Some firms require that each and every purchase have a Purchase Order signed by the owner. The person who heads surveying or construction layout operations should have established purchasing privileges with reasonable limits as should every party chief.)
- equipment checking and adjustment (List and uniquely identify each piece of equipment needing periodic adjustment, even prism poles and tribrachs. This way even short breaks in the work can be used productively. Perhaps prism pole #3 was the only one adjusted during a short break while the party chief transferred a coordinate file to the data collector. But, JT's initials are there on the checklist next to prism pole #3 along with today's date. What could be clearer? This is better than JT sitting in the truck waiting for the party chief.)
- inventorying supplies and equipment
- numbering pages of new, blank, bound field book pages

- mission planning and network planning for GPS observations
- advance work on projects you *expect* or *hope* to get (This beats doing nothing at all. At the very least, it's practice.)
- computer file housekeeping
- picking up stakes and monuments
- buying and replenishing consumables
- organizing the equipment room
- practice for newbies holding a plumb bob accurately and steadily
- practice for newbies holding a prism pole plumb and steady
- instructing the newbie on how to set up an instrument
- practice for the newbie setting up an instrument
- practice measuring with steel tape and plumb bob
- pacing practice and contests (space permitting)
- lunch for the field crews on the boss's tab
- a newbie class taught by a party chief

Make down-time profitable indirectly through meaningful chores and activities. Get the crews used to working at something instead of hanging around. Consider little incentives like, the newbie gets a five-dollar gift certificate to McDonald's when training module #1 is completed with a grade of 85% or more is achieved on module #1's test. A grade of 90% or higher on modules #1, 2 and 3 earns a \$20 gift card to Home Depot.

Training

The last item in the bulleted list and the last paragraph above lead us naturally to the topic of *training*. Training is another overlooked downtime function that will increase profits. Young members of the crew can study data collection methods, memorize point descriptions (feature codes), or study prepared materials with some method to assess what has been learned, such as a quiz or test.

Field personnel often benefit from just watching what office people go through while processing their data and making finished maps and plans. Modern data collection capabilities require greater computer literacy and more complex thinking than earlier methods, and many field people think the office staff is simply loading up their own work on the field parties, so the work in the office is easier. Think of the benefits if the field crew could really appreciate that a few seconds of sloppiness and lack of attention on their part repeatedly costs a quarter or half hour of office time.

Many firms are afraid to let anyone but equipment suppliers adjust cross-hairs. Some people are simply brutes and can damage delicate equipment by over tightening. But, you know who they

are in your firm. Why not train the gentler, more sensitive types to maintain and check your instruments? And, all permanent employees who work in the field should know how to adjust tribrachs and prism poles.

One way or another, a modern surveying firm has a training budget, either a recognized, planned approach to training or the all-too-common, invisible one – time wasted day after day, week after week, and year-after-year for lack of training. You decide. You pay either way. This is a law of nature, like gravity. Learn to explore its benefits.

Purchase or create, and USE, training materials that provide some means of measuring progress (timing expected to study various units, tests, etc.). Make certain that accountability is built into the process. A little work performed by your more capable personnel to develop/assemble study materials, which can be done during down-times, will produce study material that can be used over and over again for years with little additional input.

Remember, that newbie standing around talking about sports to the people performing the more skilled work (like equipment adjustments), is learning nothing, distracting those who know what to do and encouraging mistakes and lack of completion through distractions. It's better that this non-productive, chatty person be isolated with some study materials and expected to learn something new. That's why this person is being paid instead of being sent home for the day.

“It's not my job!” – Training the team as a team.

In our competitive times, success depends upon your business being a well-oiled machine. In other words, it should run without friction as its many (or even a few) members function without resistance and ‘squealing’ in their respective roles. Each member of your team is dependent upon the others in order to have their own role fulfilled. In a true team-environment, the work becomes enjoyable.

Routine chores should be assigned to SPECIFIC individuals so that a sense of responsibility is given to the person assigned a task. Failure to do the task should be addressed. Repeated failure to meet an assigned responsibility must be corrected.

When routine and necessary functions are left to chance, you just don't get that well-oiled performance. Everybody expects someone else to take the initiative. Human nature says, “Let someone else do it.” Some employees may even heckle those who do take individual initiative.

If ever the phrase is heard, “It's not my job,” it's usually an indicator of trouble in the camp. Everyone needs to know whose job it is to do the regular chores and still be willing to pitch in and do the other person's job when that person is for some reason unable to do it. This is what a team's about. It doesn't just happen. It requires training, and not all training is about technical matters; people need to be trained and mentored to function as a team.

Preparation for Staking

Now we come to the actual layout activities and the computations needed for layout. The needs of every project are similar but different. The person or persons using the control you stake should be consulted regarding what they want and need. In any case, the items to be staked must

be related to each other in some fixed grid of coordinates that relate to points on the earth, usually the parcel boundaries.

The Geometric Plan

This Geometric Plan is discussed earlier in the section covering proposals, and later under *Typical Requirement for Construction Layout*. A very brief review: In earlier times, final site/design plans were developed often without any coordinate geometry calculations having been performed. Plans were hand-drawn and dimensions from boundary line to proposed improvements were often scaled from boundary lines that were not drawn to scale. In those days, the first thing to do when awarded a contract for construction staking was generate a coordinated, geometric plan, TO SCALE – in other words, establish north and east coordinate values for features to be staked and actually plot them. In the mid 1980's, many firms were using COGO (coordinate geometry, usually DOS based programs to compute the coordinates) and plotting these by hand, and it was a time consuming process. In today's world, it would be uncommon not to have as a starting point for construction layout a CADD file, often a .dwg or .dxf file.

Many designers providing a digital file of their design will require a licensing agreement or disclaimer prior to releasing their file. Some may even require a fee for their trouble. Fees charged for the release of recent designs seem to be disappearing as do licensing agreements, but normally its worth paying the plan originator a nuisance fee rather than starting over to create a geometric plan from paper plots.

If you are not the surveyor who performed the boundary survey upon which the project is based, you need to disclaim clearly in writing, best done in your proposal, that you are not resurveying the boundary or certifying its accuracy. This is covered in detail elsewhere in this course.

Almost always, except in very large tracts being only partially developed, the property and/or phase boundary is the outer geometric constraint within which all development must fit. So, the physical evidence of the boundary needs to be located in the field and the dimensional constraints of the design drawings fit to that evidence. It is best to develop a geometric plan with critical coordinates computed and plotted prior to staking any features for construction. If you are pressed for time and fail to do this, it is possible that you will verify, for example, that the building fits on the site within the area allowed per the plan's zoning setback lines (sometimes called building lines of yards), but later determine that the parking areas don't fit, and that it would have been necessary to move the building slightly to make all construction fit in areas permissible for construction.

Technically or legally speaking, this determination may not be your responsibility. That every improvement should fit within setbacks really should have been verified by the site designer (architect or engineer, or sometimes surveyor) long ago. But, you can avoid the "blame game" that is so common in construction layout squabbles by notifying the team of problems before they become costly by creating your geometric plan up front and early. If you leave the computation of coordinates for each item to be staked until a call comes ordering that staking, you discover problems at a time sure to cause delays and embarrass somebody.

Revisions you make to the design

Because of my experience as a site planner/designer and my computational genius (really, inflated ego), early in my professional career I made small adjustments to design drawings when I thought that my idea was better than the designers' were. (The bible warns that pride goeth before destruction, and this haughty attitude brought me some scrapes and bruises.)

Once, because of a hand-drawn, out-of-scale boundary on a site plan, a building I had to lay out didn't fit on the site without some rotation to keep it out of the building setbacks. To the best of my memory, I rotated it three or four degrees and set the parking and drives with their drainage structures to the orientation of the building.

I'm now embarrassed to confess that back then, I did this without the approval of either the architect or the site designer. The short story here is that the building was a mosque, and its position on the site had been designed to face Mecca, a fact of which I was totally ignorant. After it was built, I was called to the site to perform celestial observations and publish the as-built, astronomic bearing of its sidewall.

The astronomic bearing of WHAT? I'd never heard of such a thing. I asked why this was needed. Only then did I learn why my slight building rotation to "improve" the plans and keep the project moving was downright foolish behavior. Nothing disastrous came of my unauthorized change to the plan, but I sweated it for some months, wondering if the axe would fall. The plan I was given was out of scale to the point of being unworkable, a fact I discovered creating a geometric plan. But, I should have called the civil engineer who created the site plan and coordinated a solution with the professional who knew what constrained the design.

Another time, about eleven o'clock one evening, I was preparing to stake some curbing first thing the following morning. I noticed that the parking area would drain better if I increased the slope of the adjacent parking by lowering the nose of a curbing island. So, I changed the elevation at the nose of that island when I laid it out the next day.

The curbing was shown on a grading and drainage plan for that job, and the sanitary sewer was shown on its own plan. I did not review the sanitary plans prior to making this change. Therefore, I didn't notice that on those other drawings in the plan set, a sanitary manhole was proposed about three feet from the nose of the parking island I had lowered a few inches to improve surface drainage. This "improvement" of mine to the design cost me nearly a thousand dollars, and at that, I got off cheap. I had to pay the costs of ripping out the curbing and reinstalling it as per the design so that the curbing would fit to the grade of the sanitary manhole rim.

A little knowledge is a dangerous thing! In this example, I failed to consider the full plans for starters. Then, I failed to recognize the expertise of the other team members, specifically the design engineer. Had I sought approval for my "improvement," I would have been saved the backcharge and most of the embarrassment.

It's not easy for me to relate these stories. But, if my experiences can save you from being as prideful and stupid as I was, then relating these true stories is worth the exposure. I could have

related the same information in some hypothetical fashion, but nothing has the power of a true story.

On being a “team player” – Never fly solo!

It's important to note that neither of these two, true stories just related represents either errors or omissions. They illustrate the result of ignorance, pride and a failure to recognize my place on the team and to show proper respect for other professionals.

I learned through these two episodes that one must never make corrections or improvements to plans without the blessing and documented consent of the professional who prepared the plans. The architects, engineers or other professionals on the team know things I don't know about why the plans were designed as they were.

I've met people who err on the other end of the spectrum – those who will just stake something they believe to be in error, taking the attitude that the one providing layout is only responsible to stake per the plans, and if it's wrong, the designer will have to take the fall. This is not being a team player either. Before long, a person with this attitude won't be on the team at all. There is no place for an independent and uncaring attitude on any team.

It's good to remember that there are two faces to independence. One is essentially caring, yet ignorant (as in my case – really trying to better the product but without consulting the designer). The other is uncaring (the person who will just stake a design, thinking it to be inferior or even in error, reasoning that the axe will fall on another's neck). These are two sides of an ugly coin. Independence is a currency of negative value on the construction team.

Digital Drawings and Data

In our time, with a few rare exceptions, any project drawings of consequence are produced on computers, and you will likely be provided with digital files.

Some firms require you to sign a disclaimer intended to shield the plans' author from your misuse of the plan. Some disclaimers would seem to make you responsible for verifying all their data. It's a legal question how much liability can be passed to the layout professional through signing a designer's disclaimer. Occasionally a licensing statement will appear on the digital drawing. A few firms require a fee to cover the cost of their efforts – or maybe just to make a buck. I don't see this as much as I once did, especially when drawings are shared to move a current project forward.

Most firms readily provide digital design drawings in AutoCAD or MicroStation format (*.dwg/*.dxf -or- *.dgn) to work from. Most firms designing in the MicroStation *.dgn format will save their drawing in AutoCAD *.dwg format or *.dxf format if asked. Some firms have associated LDD/LDT project files or file formats created with other software. Usually, you should obtain files compatible with your own software if it's possible for the provider to save their digital files to your format. It's always worth asking. Don't assume the designers can't save to your format. A lot of duplicate work is involved if you can't get the data in a format compatible with your software.

At the very least, request an ASCII file of the coordinates for the boundary points, any control traverse placed on or near the site and any critical points controlling proposed improvements such as wetlands, easements, building placement, pavement centerlines, parking corners, etc. These coordinates can be generated in the designers CADD product very quickly. Pay for them if you need to, and save yourself both the unnecessary exposure to liability and the time (money) it will take you to develop those primary coordinates from scratch. If you take this approach plot your product and lay it over a final plan on a light table (or taped to a large window) to verify no visible deviation from the design has been created by your computations.

To believe or not to believe – That is the digital question. (Answer: Don't you *dare* believe!)

Always verify that the line work in a digital drawing matches the dimensions provided on the plans that specify actual spacing between improvements and other controls. Some plans contain 3D objects and polylines. Even lines may have elevations associated with them. Many times manholes and other proposed and existing features will be placed in the drawing with elevations.

In prior, 2D times, CADD drawings were essentially 2D products. Back then, all distances between the drawings' objects were horizontal distances.

Not necessarily so today. This means that distances queried between pick-points on features in the drawing file may report vertical distances between those elements and not the desired horizontal distances. Such differences may not be immediately apparent in the distances you list if the difference in the elevations of the objects queried is not significantly different. Be VERY careful, as some objects may be two-dimensional while others have non-zero elevations associated with them. Always list the objects' properties to determine if they are 2D or 3D. Never just assume they are 2D. Labeled dimensions will usually govern over distances between the graphic elements in the drawing. Unfortunately, some CADD graphics, whether 2D or 3D, are not dimensionally "pure." That is, the objects that display as graphics are not drawn to scale, or they've been corrupted. When any doubt exists, ask the maker of the plans which should control – labeled dimensions or CADD objects. Never assume the designer's intent if it is less than crystal clear.

Another common problem is that designers unfamiliar with the need to not move or rotate the drawing may have moved the drawing off the points associated with the boundary or other control. If the designer furnishes coordinates for proposed improvements, they may not relate exactly to coordinates derived from the original survey. Large shifts of this kind will be apparent. Beware of the little shifts that don't appear to the eye. Verify that your drawings and all coordinates you may have been given do, in fact, agree.

This verification of digital CADD data and listed coordinates is absolutely critical to perform at the beginning of the construction layout phase.

Architectural and Structural Drawings

Personally, I rarely request digital Structural/Architectural drawings. I always use paper drawings after verifying with the designer that the plan set I've been given is the latest version available and is truly "for construction." Even experienced construction management clients have given me outdated plans. This has happened repeatedly. It is amazing how often I've even received superceded plans, even to stake buildings from. It's unbelievable how dense construction layout clients can be about this. Make the extra effort to verify that your plans are absolutely the most recent, current, for construction, plans. Then, document the assurance you've been given in writing, in a CYA memo. More on this near the end of this course.

Most site plans are conceived while the principle structures are still under design. Thus, the buildings shown on site plans are often not the exact buildings to be constructed. Always stake the building footprint and columns based on the architectural or structural plans. Never, never assume the footprints of the buildings shown on site plans are correct or final.

Whenever possible, get your plans directly from the architect and/or structural engineer. Verify that they are indeed "final" plans and are "for construction." Even if you must get your plans from your client, call the architect and structural engineer and verify that the plans you have are the latest and the final plans. Write CYA memos stating the name of the person or persons who provided the latest plans, the date, time and place of the conversation or meeting or method of delivery, and the latest revision date and specific title and sheet number of every plan you've been furnished to lay out the building. At a minimum, copy the architect, the structural engineer, the civil engineer, the contractor who will construct the building and your client.

On a recent project, I did have both paper and digital versions of structural drawings for a very expensive, structurally complex, immense residence. The plans were drawn purposely out of scale to illustrate a very slight offset in one column line from another. If drawn to scale, the plan would have visually portrayed one continuous column line, so the AutoCAD drafter separated the two lines for graphic clarity, thus destroying the dimensional integrity of the digital product. The paper plans were made graphically clear at the expense of the digital data. I suspected this to be the case, but called to verify this was true and documented my conversation. Be very, very careful. When in doubt, ask. In fact, when you feel confident that you know what is going on, as in this example, ASK! Beware of assumptions.

Was it a bad decision on the part of the structural engineer or structural draftsman to corrupt the dimensional integrity of the CADD product for the sake of the visual clarity of the paper plans? No, I don't think so. But, it surely would have been a bad decision on my part to trust the digital product without verifying that its graphic elements should yield to labeled dimensions on the paper plans.

I never use just the architect's or structural engineer's digital drawing for construction layout. Signed and sealed paper drawings are still the basic authority regarding the professionals' design. Digital drawings are shared generously in our time, and those of us who spend countless hours in CADD drawings sometimes forget that paper prevails.

Almost always, paper plans bearing the professional's seal are the authority when I'm creating my geometric plans for staking. Be careful if using digital files. They are a tremendous convenience, but they're potentially dangerous if used without proper analysis and verification.

Some providers take the attitude that they'll stake buildings only from structural drawings, and that they have no need to obtain, much less review, architectural drawings or compare them with the structural drawings. The fact is, often the two do not agree perfectly regarding common dimensions. In addition, it is not always the structural drawings that prevail over architectural drawings, as I've heard some surveyors state confidently in their ignorance. Often, too, architectural and/or structural plans lack dimensional integrity or omit critical dimensions.

Never assume the value of dimensions that are not clearly labeled on the plans or that cannot be verified by comparing the sum of individual dimensions to the overall, total dimensions. I always check strings of critical, intermediate dimensions to verify that their sum equals overall dimensions. Redundancy is crucial to verification. Believe me when I say that, often missing dimensions indicate some critical component of the design has not yet been determined. Don't assume column spacing is uniform if one dimension in a string of dimensions is missing. Never, never, NEVER fill in the blanks with your logical assumptions. Let the design professionals who made the plans do it.

Sometimes the architect is waiting on the structural engineer's determination, and other times the situation may be reversed. This is often the reason for missing dimensions on so-called "final" plans.

Some providers will not even look at the individual strings of dimensions and only stake per the overall dimensions. They think that raising the flag is unimportant when intermediate dimensions don't agree with overall dimensions or when there aren't enough redundant dimensions for verification. This may work when staking the "box" for a simple, residential home, but never take that attitude when staking commercial buildings or buildings of any significant complexity or size or even residences large enough to have column lines named and dimensioned.

Finally, I must impress upon you the countless number of times I've discovered errors in the plans that could have resulted in stakeout errors and construction errors. Would I have been liable? Most times, no – provided the plan error was not glaring, and if I did not fill in some missing dimension with my assumption. But, the project would have suffered in some way if I had not raised the flag in the form of a question – a request for clarification or confirmation.

Site Development Plans

On site plans, in most cases, the line work of the digital file is drawn to scale. Exceptions and things-to-watch are noted above. If a parking lot is labeled as being 65 feet wide, the lines representing its edges will usually be found to be parallel and 65.00 feet apart. BUT... not always! Be careful.

A danger in the digital world that didn't present itself in the paper world of the bygone, DOS/cogo era is that a non-technical person can now effortlessly and mindlessly generate coordinates used to stake improvements by merely "picking" points on the line work and the symbols in the digital file. This is extremely fast and can be equally dangerous. A thorough

knowledge of the old cogo calculations seems unnecessary anymore. SEEMS unnecessary! Today, cogo calculations can be accomplished by most survey software packages functioning in a graphic, CADD environment. Be sure your technical help knows how to use this power responsibly.

For example, non-professional, inexperienced personnel may “pick” a coordinate at the corner of a parking lot or at the insertion point of a manhole in a CADD product and establish coordinates in mere seconds based solely on the graphic positions of features. A digital representation of something may be a foot or two or even more off in the digital drawing file without being noticed. Zooming in and out of the CADD drawing destroys the sense of scale that one has when viewing a paper drawing. If you allow a CADD person who is not familiar with the your discipline to generate coordinates used for layout, a graphic error of several feet may not be discovered until the as-built survey is drafted. Horrors!

Assigning inexperienced personnel to create today’s version of the geometric plan is, in my opinion, both reckless and irresponsible. My advice is that more experienced personnel perform the task of generating coordinates for the layout. In today’s competitive environment, the level of checking that was common practice 40 years ago has all but vanished. Final plans are regularly published with errors, and that’s how it is.

It has become common practice that computations to establish coordinates for layout often not checked. One business owner/surveyor fired a senior surveyor for staking catch basins wrong on a subdivision roadway. That unfortunate surveyor who lost his job had computed the layout at the end of a 14-hour day, and the surveyor/owner did not check his work. Work that is not checked will occasionally have errors, no matter what caliber of person does the computing. You decide (and take personal responsibility) for whether or not you check the work of subordinates, or of whether anyone checks *your* computations. It’s a business/risk-management decision. Unlike the surveyor/owner in this illustration, take responsibility for your decisions.

Since you as a layout professional may be the last eyes to see a design before it presents itself in three dimensions, it’s always wise to have experienced eyes and intuitive minds creating the coordinates from which staking is performed. To think of this function as just the mindless task of popping coordinates into the digital product by “picking” objects in the drawing is a dangerous viewpoint to hold.

The person establishing coordinates for construction layout may be the last line of defense against errors NOT discovered prior to construction. This is a noble role. Don’t assign it to an inexperienced person. And, check the work of even your experienced personnel – unless you are willing to assume the risk of not checking.

We live in a difficult time. When I began my surveying career in the mid-sixties, EVERYTHING was checked. That was the typical, professional way. And, that is how it still should be. Sadly, that’s not how it is. Professionalism has bowed to pragmatism; the pure character of ethics has been imprisoned by the tyranny of budgets; and what ought-to-be has been crushed under the feet of what-works. Result? Plans have errors, lots of them.

So, you discover errors in the plans.

No design professional with good sense will resent your humbly presented inquiry about lacking, confusing or apparently erroneous data on his or her plans. Corrections to paper or digital plans are inexpensive compared to problems that go unnoticed until they appear on the site as new construction.

It is beyond the scope of this session to cover this fully, but a few suggestions will convey essential principles and alert you to common pitfalls.

- Trust nothing but redundancy – Always look for two or preferably three things to confirm dimensional agreement. This applies to site design drawings as well as architectural and structural drawings.
- Make personal calls for clarification when something looks wrong or suspicious – When something looks ‘funny’ call the document’s author/designer. Humbly request clarification for interpretation of the plans. Many times some other plan in the plan set provides the clarity, and you just didn’t know where to look. Other times, you’ve discovered something wrong on the plans. This doesn’t make you a hero any more than it makes the designer incompetent. Humans make mistakes, and your turn is coming. Whatsoever you sow, that shall you also reap. Thank the person who erred for helping you figure out the question. They know they erred; you needn’t point that out to them.
- Put the resolution in writing – AFTER you’ve worked out the solution in a personal, friendly call, THEN draft a C.Y.A. e-mail or memo that goes something like this:

Dear Bill,

Thank you for clarifying my dimensional question regarding the distance between Column 1A and 2A on Sheet S-3 dated _____, and revised _____.

This is my understanding of your direction: The overall dimension string is correct per the plan and I am to change the distance noted above to 30’6”, not use the 30’0” dimension shown on the plan. Please advise immediately if I’ve misunderstood anything, as we will be staking this for construction tomorrow.

Again, Bill, I appreciate your rapid response to my question.

Sincerely,

Jonathan Terry, PLS

This should always be the tone of your letters, e-mails and CYA memos. You’ve stated the source of the error, should it ever come to a battle. You’ve cleared yourself of blame, placed responsibility for your direction on the designer and made a friend in the process. Who could ask for more?

Never stake a building from a site plan – or stake *anything* from an OLD plan.

OK, you know this. I've said it before. But just in case your 10 year old has stolen this and has just started reading it by flashlight under the covers, let me re-state the warning:

Never stake a building or any significant improvement from a plan created primarily for another purpose or a general purpose.

For example, site development plans depict the building, sometimes with dimensions, but that is not the main purpose of site plans. Architectural and structural plans are created for the express purpose of the building construction, and they must be used to determine building dimensions and data.

Sometimes both the architect's site or first-floor plan and the engineer's site plans show different views of proposed improvements close to the building. When shown on both plans, I suggest asking both designers for clarification on whose plans govern in that area. If they don't agree and give the same answer, put them together in a conference call with you to resolve the issue.

This is one example of why I consider it foolish to layout buildings only per the structural plans, as some surveyors will state. This is a bad policy. I always compare architectural plans with both site plans and structural plans. Many, many errors have been caught prior to construction by doing this.

Often, the site development folks have not been given the current architectural/structural plans, which are being developed concurrently. Architectural plans change as the structural design is refined. Sometimes, an architect's aesthetic interests result in changes to the structural plans. Designs change after bid sets are released. Nothing is stable. The change-it-demon is out to get you!

Principle: Everything changes and nobody tells the others on the team about it.

Principle: You have an old plan. Didn't anybody tell you it's changed?

I suggest a periodic mailing to your client via snail-mail. (NOT e-mail – that most unread, unheeded confusing convenience in communication since the Tower of Babel, and that promises to spell the downfall of modern society).

My client's project managers and project superintendents receive a memo in the mail saying, "Remember – it doesn't get built according to the most recent plan; it gets built according to *MY* plan!"

I follow this by noting, "I am about to stake _____ per plans you supplied on _____, dated _____. If these are NOT the most recent plans, or if there have been any supplemental plans affecting the layout, please advise me immediately, so I can adjust my computations and layout to conform to any changes.

Don't underestimate the need to CYA regarding the building layout. Buildings are expensive! Stay clear of the blame-game when it comes to building layout. Document everything you can in writing. And, check your computations very, very carefully.

Never-never land – things to avoid (and to remember)

Never underestimate the task

A “simple” layout request may turn to an ultimate challenge once the crew hits the site. Construction sites are dynamic, always-changing environments. Control points get destroyed; sight lines get blocked and layout needs change constantly.

Never send the “junior” crew

Send your most detail-oriented, competent, personable, flexible, thorough, cool-under-pressure, business minded, emotionally mature personnel to do construction layout, and send them prepared with an uploaded collector capable of computing in the field. The days are gone when a sheet of paper with presumed instrument set-up points, backsights and angles-to-turn will suffice for most layout needs. Your client will think you a dinosaur if you send crews out so ill prepared.

Often I've heard surveyors say, “I don't want my field crew to do too much thinking out there.” I heard it the week prior to preparing a portion of this course. I've worked for firms whose owners abide by that philosophy. Their field crews translate this to mean, “I don't trust your judgment and capabilities.” A survey crew incompetent to function professionally should not be sent on a construction layout assignment. Period.

Never under-equip the crew

A layout person lacking the equipment necessary to perform the job is as insufferable on a construction site as a carpenter without a hammer or an equipment operator sitting around because his fuel tank is empty. No amount of excuses will win the admiration of the people you disappoint. Equipment needs are discussed elsewhere in this course. Suffice it to say that your client has no patience with subcontractors who under-equip their personnel.

Never rush the crew

Some managers are in the habit of thinking work should always go smoothly and be completed in a minimum of time. Their crews often hear, “This will be simple; you should be done with this assignment and move on to another other job right after lunch.”

This is not a winning strategy when it comes to construction layout (if it works anywhere else?!?). The construction site is a noisy, sometimes dangerous environment. Placing the person responsible for the layout under unnecessary, additional pressure will eventually lead to costly errors and maybe injury or death. A rushed mind is not a clear mind. A person who is not present to the task at hand but instead is feeling rushed, whose mind is churning with images of the boss's displeasure over taking too long, is a self-fulfilling prophecy waiting to happen.

A word on errors – Errors are the construction layout provider’s nightmare. On the construction site, errors seldom go undiscovered. If a person is breathing and active, he or she WILL make errors – unless that person is like the owner of a firm I once worked for. That company was in its second generation, and the current owner honestly believed and clearly stated that neither he nor his retired relative who founded the business several decades earlier, EVER made a mistake. (Honest!) The employees of this firm were placed in a constant atmosphere of tension, waiting for their inevitable human failing and the abusive tirades this owner dumped on the unfortunate souls who erred.

This created a climate of pressure that emotionally distracted his employees and sometimes made them frantic. ‘Frantic’ has no place in the layout crew. Methodical, unhurried and confident staff is what’s needed.

You may have guessed it: that business owner was a surveyor. Surveyors can become quite lost in their own view of life. (I know. I am one.)

Contractors know better. They know errors occur, and they are generally more tolerant of fallible humanity than those engineering-surveying personalities who spend lots of time in theoretical realms. Even though contractors and construction managers are immersed in practical realities, and readily forgive human errors, you will probably have to pay for your errors. So, you may as well create a climate that minimizes them. Specifically, my advice is this: never put your employees under pressure when they are headed for the construction site.

A preacher once said, “All pressure is violence, and all violence comes from the devil.” Do your employees see you in their dreams adorned with horns or a halo? You may chuckle, but this is a serious question. Its answer has certain and inescapable consequences, good or bad. It’s just a matter of time.

Never underestimate the liability

When errors do occur, you or your firm will be back-charged for the costs occasioned by the error. In the course of my own construction layout business, occasionally a call came to my office. “Something seems to be wrong with your layout. Can you come take a look?”

Nothing, absolutely NOTHING received a higher priority than such a call. I would say something like, “OK. I’m on a job about 45 minutes away. I’ll shut down here immediately and be at your site within the hour.”

If it turned out to be an error I’d made, which thankfully it seldom did, the consequences would increase with time. Equipment could be standing around or some subcontractor might proceed along with construction knowing that anything built wrong would create an extra fee for them to cover demolition and reconstruction (which they’d approach at their leisure), and I’d pay the tab – often a padded tab.

Generally, whatever generated the frightening call only “looked wrong.” But, I was never upset with a false alarm, even if it pulled me off another important job. Discovering it was a false alarm was so much better news than if it had been an actual error. I’d patiently check and explain why my layout was right. I would humbly and respectfully clear the confusion in the mind of the person who cried wolf; and I didn’t charge for the visit. I thought of this as PR or business

promotion. My responsiveness was always appreciated and it was truly self-serving in that it promoted the all-important working relationships.

On the thankfully rare occasion when I or my firm staked something in error, I'd frankly admit my error, plead for mercy, correct the staking (without fee, of course), and thank the supervisor who called me to the site for letting me know so promptly. Unlike the surveyor mentioned above who believed he'd not erred in decades, construction people live in the real world and know that errors occur. They just need it corrected, and they move on.

Never underestimate the Construction Manager's role

Throughout the rest of this material, depending on the scope of the project, the term Construction Manager may mean, the Design-Builder, the Constructor, the Project Manager, the job-site Superintendent, the Construction Management Company with its staff, the General Contractor – any or all of the above. Where clarity demands, I'll specify which I'm speaking of. Usually, I'm referring to a construction management firm or site superintendent. But, because most of this presentation applies more-or-less to all these entities, I'll hereinafter call the firm, person or team responsible for coordinating the construction the **CM** – meaning in a general, broad-brush way, the **Construction Manager** or the **Construction Management firm**. This person or business entity is almost always your client.

The CM hires you to perform necessary construction layout activities. But, the role of the CM goes far beyond this simple interaction with you or your firm. The CM serves as facilitator, problem solver, coach, mediator, choreographer, morale-builder, budget-keeper and sometimes whip-cracker. Think about it. The CM is the last link between all the heady and creative design disciplines and the thing that gets constructed. The CM is like the narrow part of an hourglass. All the design elements and financial resources squeeze through this narrowing between theory and tangible reality.

In this important capacity, the CM often finds plan or design errors, or things that just don't work well, are inefficient, or unnecessarily expensive. The CM transforms thought into creation, paper into concrete, theory and design into three-dimensional reality. The CM is a problem solver by nature. Theory be damned; the thing must be built!

The CM is a realist who knows better than most design professionals do the value of relationships. If you've made a friend of the CM, the CM's representatives and the sub-contractors on the site, they will empathize with you if you err; they won't scold you or resent you. And, building relationships is so important.

Never underestimate the value making a friend – True Story

The impact of a true story is many times greater than any illustration based on what *could* happen or *might* happen. What follows is another true confession of what *did* happen, believe it or not.

On a job back in the late 1980's, my firm made a significant error. Actually, my right-hand assistant made it. He calculated the centerline intersection angle of two roadways at a major

office park development, assuming the centerlines of two intersecting roads were at 90-degree angles to each other. (The plans we had at the time did not specify the angle.)

A surveyor-friend of mine is fond of saying, “ASSUME makes an ASS of U and ME.” However logical or reasonable an assumption may appear, don’t make it – not when performing construction layout!

Here’s what happened. The late 1980’s was a boom time. Development in the greater Washington, DC area was thriving.

One day, I received a call from my client to stake clearing limits for a proposed, mile-long roadway running through a wooded, commercial development project – a development of considerable, economic impact to the area that government regulators had placed on fast-track. I’d not worked on this project prior to receiving this call.

I serviced several fast-track, major developments at that time. What is a fast-track project? Fast-track status was awarded to projects deemed by Fairfax County, VA to have particular importance to that county’s economic development. What made these projects unique was they were allowed to start construction prior to county approval of final design plans. Based on preliminary plan approval, certain elements of the construction were allowed to proceed ahead of the final design approval of the project as a whole.

For me, these projects were especially dangerous. The potential liability for errors increased on fast-track, because plans were being revised and finalized at the same time actual construction activities were taking place. Thus, my geometric plan computations for layout of any particular features on fast-track projects were not performed until calls for that specific layout came in. This approach sacrificed the checks I normally enjoyed when computing projects as a whole. Instead, piecemeal calculations were made, here a little, there a little. Calculating the project as a whole is much safer because dimensional relationships of all elements are considered together; everything designed to be constructed must fit dimensionally on the site with other elements. When an entire site is computed at the same time, plan errors (or my own computational errors) may be discovered when one feature doesn’t fit correctly with another. But, taking the usual, holistic approach to geometric plan computations was simply not possible for fast-track projects.

On fast-track projects, I’d receive a request for layout, go to the client’s office, pick up the latest version of design plans and supplemental drawings, compute the layout, compose and mail my CYA memos (covered later in this course) and then go stake it – all in a very, very short time frame. Typically, information was incomplete on the plans because they were not truly final plans; they were works-in-progress. Design work, county reviews and approvals, and construction were taking place simultaneously – in steps that often overlapped.

At the time, my client requested staking of roadway clearing limits, the site plans did not specify the centerline angle formed by the two intersecting roadways that served as the starting point for the staking. But, the clearing limits for this project’s proposed roadway network were not super-critical. The plans furnished enough information to establish the new road’s starting point at the centerline intersection as well as the centerline alignment of the proposed road through the site. We could scale the roadway’s clearing limits from the centerline.

Since the project's new road centerline was tied dimensionally to the perimeter boundary lines, and evidence of the property corners was present and checked well, the plan information was sufficient to fulfill our first assignment on this project: to stake clearing limits for a mile of proposed roadway winding through the project.

My business was overloaded with work at that time. I assigned the computations for this layout of the clearing limits to my right-hand assistant, a person who lacked years of experience and the instincts born of such experience, but who was a quick learner. I performed minimal checks of my assistant's computations. I placed a plot of his work over the to-scale design plans on a light-table and found agreement between the site plans and our plot showing the proposed road's centerline and its clearing limits. I did not check my assistant's coordinates for the existing, intersecting roadway's proposed centerline, because it didn't matter at that point in time. It wasn't needed. Again, our mission was simply to stake clearing limits for a new roadway at that stage of the project.

About nine months later, and many revisions of site plans later, the developer was ready to construct utilities at that same roadway intersection that served as our starting point for our first layout.

Not remembering that the computations for that major intersection were unchecked, and finding points with coordinates along both intersecting roadway centerlines, I staked several huge drainage structures at all four corners of that four-way intersection. I staked them based on our original, centerline intersection computations having totally forgotten by then that my assistant, not I, had performed the initial roadway centerline computations.

Two weeks after staking this intersection's storm structures, my phone rang. It seems that another surveyor had staked the curb and gutter for the parcel across the street from the project I'd been staking. Per some arrangement between developers, my client was responsible for installing all the storm drainage at the intersection, and the developer across the street was to construct the curb and gutter for that intersection. The other surveyor's staking for concrete curb and gutter wasn't matching several huge drainage structures already in place at that intersection (staked by me) that were supposed to align with the proposed curb lines. I was asked to come to the site and try to determine why a discrepancy existed between the storm structures installed per my stakes and the curb and gutter stakes set by the other surveyor.

First, I set up the instrument and checked the as-built locations of the structures. They were constructed in the right place per my coordinates. I noticed that the curb and gutter stakes reflected an agreement as to where the two centerlines of roads intersected, but the realigned and widened roadway appeared to be rotated about the point where the two centerlines intersected.

My assistant and I researched our records to refresh our memories of the basis for our computations at that intersection. Months passed between that first call to stake roadway clearing limits and the call to stake the drainage structures that were now installed. Gradually it dawned on me, to my horror, that I had not initially computed the intersection myself; my assistant computed those points.

Those early plans did not specify the angle at the intersection of the two roadway centerlines, and so there was no way to compute points along the realigned centerline. Had I been the one

computing that initial layout, I would not have created points along the realigned road's centerline. My assistant, thinking he was going the extra mile, made a critical and wrong assumption. The roads 'looked like' they were at 90 degrees to one another, so he computed the realigned roadway that way and established points along its centerline. I used those points in computing the drainage structures at that intersection, and now they sat there – in the ground, in the wrong place. My heart sunk. This was going to be very, very expensive.

This took place in Fairfax County, Virginia. Larger storm structures in this county were designed with openings along the curb line that varied in length depending on how much water would flow to that structure. The four structures at this intersection were custom-made in three, precast concrete sections each and shipped to the site for installation.

The top section of the each storm structure was a "cap" about six feet wide by twenty feet long that included a "throat." When installed, the throat appeared as an opening along the curb line. These throats varied in length depending on how much water each structure was designed to intercept and collect in the sections below. All four structures had throats about twenty feet long. Below the cap section was a middle section, essentially a rectangular, precast concrete box having neither top nor bottom. Because of the long throats, these middle sections measured about six feet wide by twenty feet long and were three or four feet high. The four bottom sections were the same size and shape as the middle sections except these had bottoms and holes to accommodate the large pipes that entered and left the structures at various places.

Pipes connecting the basins ran under the roadways (which fortunately were not yet paved). Pipes from three of the basins ran to three different headwalls.

Can you grasp the magnitude of this layout error? Do you know how I felt inside?

I approached the CM's on-site project manager, explained how the error had occurred and concluded, "It's my fault. I'll restake it right now." There was nothing more I could say except, "I'm very sorry to have caused you this problem."

The project manager asked, "Can we move the intersection to match the structures that are already in place?"

As you can imagine, I liked that idea. But I replied after some thought, "No, I don't think so. The road alignment has been approved; the dedication for the new right of way is established based on that alignment; your engineer isn't the one who designed it; all the development across the street from your project is based on it; an as-built survey would declare the change; getting the roadway alignment changed will mean delays; the rotation along the throats of these structures is a much a two feet, and that is too much to warp the intersecting road's alignment. It's my fault. Be as merciful as you can with me. I'm a small businessman, and this is going to impact me severely."

So, that was the situation. Now we come to the point of telling this story.

What had been my relationship to this project manager up to this point? I'd served this supervisor and his firm faithfully on many project sites and occasionally gave assistance that was clearly beyond the scope of my contract without charging an 'extra' for my services. I was always polite, respectful and flexible. Once, when this project's site superintendent was in the

hospital for an operation, I called his home that evening to ask his wife if it went well. Another employee of the CM experienced a painful family problem that I became aware of, and I sought him out on the site to express my sincere concern for him and to tell him I'd be praying for him and his family. (His religion was Islam and mine Christianity, but he smiled and was clearly grateful.) I made it a point to be friendly to everyone I met on the site at all times. In short, I had cultivated a caring, sincere and consistent attitude of service. Beyond that, I genuinely cared about these people, and I think they knew it.

How much was I back-charged for this very significant error?

The unbelievable truth is that this contractor never back-charged me at all! Up to that tragic miscalculation, my posture as a servant to this client had never been faked; I served the CM from the heart and enjoyed doing it. My performance as a team player was never a put-on for self gain. It was simply who I was and how I did business – with EVERY client.

This particular client was not the easiest to work with. They would call me to the site for a half-day of layout and then ask for additional work once I was there. This cramped my schedule and made it difficult to keep commitments made to other clients. They didn't think ahead like some of my clients. They always wanted me to work on their projects on an hourly basis. (I could make about 20% more money on jobs I bid, because I was considerably faster than my competitors were. I preferred to bid, but agreed to work on an hourly basis for this client on project after project.)

I was more than rewarded through this one event for any inconvenience I may have suffered in being agreeable and flexible and treating this client in a caring, understanding way.

Most clients will not forgive such a significant error. However, if they like you, they may at least not pad the back-charge or let some subcontractor pad their hours to fix your error. Do you want to limit your liability? Do your best work every single day, and be a genuine friend to your clients. Serve them from the heart. They put food on your table.

Who knows? They may even save your skin some day. It happened to me.

In relationships, never fail to keep the Big Picture in view!

In the true story just related, justice was not served, and it was good for me that it wasn't! My client was unfair to his own interests; I should have paid dearly for my assistant's error – really for my failure to check the work of my assistant.

In another circumstance, justice was also not served. In the true story I'm about to relate, I was treated unjustly by a client. I could have demanded justice, or at least pursued it more vigorously. But, it was my turn to cover another's shortcoming and their mishandling of a situation. I absorbed a back-charge that was unjustly applied against my billing. I did everything right and yet paid for someone else's mistake.

My contract was for all the construction staking of a mid-sized, commercial development – a 14-acre, combination, office-warehouse ("flex-tech") project. The back charge was significant, including costs for demolition of over 30 feet of curb and gutter, removal of debris and construction of a driveway opening with two adjacent, curbed islands.

I didn't even know of the problem until the back-charge was applied against my monthly billing and I called for clarification. The project manager said I should speak with the site superintendent. When I arrived at the project site, the super told me I'd staked a section of curbing along a parking lot, straight through an intersecting driveway, as if the driveway didn't exist. He said a section of the curbing had to be demolished, two islands installed and the driveway apron paved.

By the time I became aware of the situation, the curb and gutter contractor had already made the "correction" in the field and the parking lot's curbed islands and driveway apron (the one I missed) were constructed. Grading had not been a critical issue at the place my error occurred, so the sub-contractor just tore out a 35-foot long section of curbing, built two new, curbed islands and the driveway apron. He did this without any additional layout from me by simply matching his new curbing to what was saved from my layout. No additional staking was thought necessary, so I was left entirely out of the loop - in express violation of my contract's language regarding suspected or discovered errors.

I went to the site feeling a bit angry that I'd learned of the error over two months after my stakes were destroyed. I'd been given no opportunity to verify or dispute my responsibility in the matter. Nobody communicated with me about it. The client simply deducted the backcharge from my billing. Rude! And this, from one of my best two clients. Besides my frustration with my client's behavior, I was upset with myself for making the error. I couldn't imagine how I missed an intersecting driveway while staking. Was I blind?

After I arrived on at the site, the superintendent walked with me to one of the parking areas on the 14-acre site and pointed to the driveway opening that I'd supposedly failed to stake. I unrolled the plan set I was carrying and saw that my plans showed no opening in the curb for the intersecting drive. The plans I'd staked from ran the curbing for that parking lot straight through, just the way I'd staked it; no driveway was called for on those plans. My stakes were had been set according to the plans I'd been furnished for that very purpose.

This site was also a fast-track project, like the one in the previous story. It was clearly my client's responsibility to copy me on any revisions to the plans I'd been given. I asked, "Where did this driveway come from? If there is some newer plan, why wasn't I advised of a revision?"

I got only half an answer – an answer to the where-did-it-come-from part. It seems the developer of the site purchased an adjacent parcel after this site was already under construction, and he requested the driveway opening be constructed to facilitate vehicular travel between the two sites that had come under his common ownership. No one thought to advise me of the change. I was clearly not at fault. And, I was very relieved. This was not a small back charge!

I sent a memo to the project manager explaining that I'd staked per plans I'd received from his CM firm. I wrote that I had no record of receiving revised plans and would have no way of knowing of a revision unless the CM informed me. I reminded this project manager that as this project broke ground, I'd sent a standard reminder (really a CYA memo) stating, "Remember. It doesn't get built according to the most recent plan; it gets built according to Jonathan's plan!" That standard memo exhorted the project manager to keep me in the loop should any changes to plans occur that affect my layout. I asked the project manager if he had a transmittal letter to document that I'd been advised of a change to the plans, and if so, please send a copy. (Of

course, I knew that no such transmittal existed, and that the project manager had erred in not advising me of the revision. This particular CM *always* documented *everything* the sent out with transmittal letters.) I expected a check in the mail for the amount of the back charge.

Instead, the project manager replied in a memo, saying he'd look into it. After that, I heard nothing more about it; and, I didn't receive a check.

Clearly, I should not have been back-charged, as the CM was responsible for providing revised plans and failed to do so. BUT... the person in the CM's organization who should have actually handed the revised detail to me was the site superintendent. If I had pursued the matter to its just conclusion (Legally, justice was in my favor.), I would have brought the site superintendent's omission to the attention of his superiors, it would have gone right to the owner of the firm and damaged what had always been my good and cooperative relationship with that superintendent.

The superintendent's job is a challenging one, full of crises and emergencies, and the little, letter-sized plan showing a change in a 35 foot long section of curbing on a 14-acre site probably arrived at his trailer in the middle of a swirl of noisy, frantic activity. He simply didn't relate that relatively insignificant change to my layout activities.

After due consideration, I decided to absorb the back-charge without further argument. The CM's team on that particular project must have been under some pressure that made them reluctant to face their responsibility. This firm had given me many contracts, and its owner was a personal friend. For the sake of the continuing relationships involved, I ate the loss without taking legal action. Making waves in this large construction management firm would not be a wise business move. I kept the Big Picture in focus.

I was wronged. The backcharge was significant and took a big bite out of my fees for that contract. It came as a shock when my expected revenues that month took a hit, and I still had to make payroll. It was rude, unjust and undeserved treatment.

My emotions, I must admit, were quite compelling. But, as I cooled down, I examined the Big Picture. Business and personal relationships were involved. The backcharge would not put me out of business. The amount was a small percentage of what I billed this firm over the course of two or three years. In general, this firm and its several teams had been very good to me. Considering the Big Picture, I had to let it go.

And so, my advice is, always keep the Big Picture in mind. Those of us who do this kind of work are usually detail-oriented people. It's easy to look at any given business situation with tunnel vision and lose sight of the Big Picture.

Never underestimate the grapevine

If you perform badly, stake when it fits your schedule instead of when it's needed, behave inappropriately or haughtily or otherwise alienate your clients, word of your insensitivity to the needs of your client will probably pass through the construction grapevine. Conversely, If you show up when you say you will, provide what you came to do and make friends of the CM's staff, they'll be your best advertising.

Too often, construction is held up waiting for the 'surveyor' to show up. Well run firms that earn a substantial portion of their fees from construction layout services will place construction layout high on their list of conflicting priorities. The impact of timely layout cannot be stressed too strongly. So many professional firms are ignorant of the importance of timely performance, and their service to their clients proves it.

If you understand your CM's need for responsive service and consistently provide what they need, when they need it, your firm will be praised, and news of its good service will be broadcast through the grapevine.

The construction world is a fraternity of sorts. People circulate from one company to another, and construction people tend to be talkers. They're outgoing, and they network both formally and informally. Your reputation is in their hands. You have no idea (well, maybe you do) how important it is that they like you and believe you have their best interests at heart.

Always-always Land – The worth of time-honored values

The sum of the above, nine never-nevers, is this: the benefit to you of living in a time when traditional and proven values are rare, is that you and your firm will stand out simply by doing what is right. In addition to the never-nevers, here are some suggested always-always:

Always-always:

- Consider other members of the team worthy of your honor.
- Send competent people to perform construction layout.
- Provide subordinates with the tools needed to perform the job.
- Allow enough time to perform construction layout without undue pressure.
- Remember how difficult the CM's job is and how small your part is in it all.
- Be reasonable.
- Be quick to hear and slow to speak.
- Be a person of your word.
- Be responsive.
- Be respectful of people in general and of the expertise of all others on the team.
- Be humble.
- Be unswervingly honest and ethical, even when it hurts you in the short run.
- Be on time; show up when you say you will.

- Communicate clearly, humbly, professionally and adequately.
- Do good deeds.
- If faced with the choice to expose or to cover the shortcomings of others, always choose the latter, and
- Stake your layout right.
- Remember the saying, “Keep your words soft and tender. You may have to eat them!”

Conclusion:

Congratulation on completing Part 1.

We’ve covered lots of topics, haven’t we? Taken together, they serve as foundational elements in building a solid, productive construction layout service or business. Your course author realizes that not all readers will apply every principle exactly as presented. This material is offered as food for thought, to provoke your own thinking on these matters and to focus your attention on ways that benefit your own area of practice.

The thoughts and principles presented in this course have greatly benefited your author by creating meaningful and happy business relationships, making money (quite a bit of it, really) and rewarding diligence with personal satisfaction through jobs well done.

This course continues in Part 2, where the course material transitions into specific guidance on typical layout methods and strategies. Part 2 uses the above material as a foundation and builds further to include:

- Interviewing and hiring construction layout personnel
- Useful equipment (some not usually carried even in equipped survey vehicles)
- Typical sequence of layout and tips for establishing on- and off-site control
- Tips on when to or not to take great care with precision
- When to adjust and balance a traverse and when not to
- Ways to stake buildings and how to document to avoid confusion
- Checking and documenting critical (high liability) layout
- Requests for layout you should refuse
- How to handle unexpected requests for layout
- Tips and tricks related to equipment and methods
- Color-coding and labeling of stakes

- Important rules-of-thumb
- Essential record keeping
- CYA memos and correspondence
- Cut Sheets (Sometimes called Grade Sheets) and Sketches – documents designed to protect you and provide maximum clarity regarding what you've staked
- Work Orders – Multi-function documents that allow you to be responsive and still get paid for your trouble and keep good client relations
- The Team and your role on it
- Lots more...

Part 2 is the other half of this course, and your instructor strongly recommends studying the remainder of the course to obtain the greatest benefit and fullest understanding. Part 2 builds upon the information and principles you've just studied.

Thank you for taking the time to study the course. Your course author wishes you success and welcomes your comments and suggestions.