Ralph J. Stephenson, P.E.
Consulting Engineer
Hiawatha Drive
Mt. Pleasant, Michigan 48858-9096
phone (517) 772 2537
e-mail ralphjsgte.net
December 6, 2000

Introduction To The Construction University

Dear Planning, Design and Construction Professional:

I am experimenting with sending an occasional essay or article on planning, design, construction, and facilities maintenance to interested professionals. There is no cost to for these essays, and I hope we may even get some Paper contributions from you for the Construction University to send out as a starting point for the e-mail university (we take the classroom to the student).

This sampler consists, first of a short essay on "Use of Float Time in Project Planning", followed by a series of 11 other essays on various planning, design and construction subjects. The hope is that you or any of your professional associates or friends will use this material for the benefit our respective professions -- but I request users to please give the authors credit.

Of course, I'm always happy to hear from you, so please don't hesitate to drop an e-line. Cordially and sincerely, with hope that you'll respond

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Consulting Engineer
Hiawatha Drive
Mt. Pleasant, Michigan 48858-9096
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e-mail ralphjsgte.net
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Table of Contents

Ralph J. Stephenson, P.E.
Consulting Engineer
Hiawatha Drive
Mt. Pleasant, Michigan 48858-9096
phone (517) 772 2537
e-mail ralphjsgte.net
December 6, 2000

Use of Float Time in Project Planning
CU essay #001

Ralph J. Stephenson, P.E.
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48858-9096
phone 1 (517) 772 2537
e-mail ralphjsgte.net
December 31, 1999

Dear Friends:

Happy Millennium! (For men it starts this year; for women, next).

I am experimenting with a construction mailing list to be used to distribute an occasional essay or article on planning, design, construction, and facilities maintenance. You are on my test list to see who is actually interested. There is obviously no cost to you and I hope we may even get some paper contributions (from you) to send out as a starting point for the on-line university (we take the classroom to the site of the student). There exists the possibility that we may post a web site for those in the construction professions so that we might make available a wide variety of topics from which anyone might choose...a glossary of terms, case studies, practices and protocol. What do you think?

I'm offering a small sample of what I'm thinking about with a short essay on "Use of Float Time in Project Planning." The idea is that anyone may use this material for any reason so long as it benefits our professions but I would like users to give the authors credit, please.

Of course, I'm always happy to hear from you, so please don't hesitate to drop me an e-line. Cordially and sincerely (with hope that you'll respond)

Ralph J. Stephenson, P.E.

Use of Float Time in Project Planning

by Ralph J. Stephenson, P.E.

-- 487 words
-- Reading time approximately 4 minutes

December 30, 1999

What is float time? It is a number of working days determined by the total plan of work, and mathematically set by the logic of the network plan, by the durations

Ralph J. Stephenson, P.E.
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48858-9096
phone 1 (517) 772 2537
e-mail ralphjsgte.net
December 31, 1999

assigned to each task, and by the completion date set for the project and its component parts.

Float is the amount of time between the earliest date an activity can start, according to a given plan of work, and the latest date it can start according to the same plan of work. Float time occurs in a task when the activities that restrain it are able to be completed before the latest date by which the restrained task must start, as determined by the latest allowable finish date of the project or project component.

Float time is not assigned by the planner, nor is it automatically allocated to activities that are traditionally critical.

Because of the nature of the construction business in which many normally unrelated organizations and individuals are brought together by agency and contract arrangements to do a job, float or discretionary time is potentially valuable to all parties to the job. Thus ownership of float time often becomes a subject of dispute and controversy.

A few guidelines which have seen general acceptance and some legal concurrence in practice are given below:

1. In a hard money fixed time contract the float time within the contract boundaries belongs to the contractor.

2. Ownership of float time should be established very early in a project. Where some question of ownership exists, the ownership rights should be noted on the plans and schedules of work prepared by the contractor.

3. On negotiated projects, where there may be a cost and time span to be mutually agreed on by the contracting parties as the project gets under way, ownership of float time is usually a matter to be worked out in advance as job conditions demand.

4. Relative to subcontractors, the ownership of float time within a hard money, fixed cost subcontract is usually set by implied consent, but normally rests with the prime contractor under which the subcontractor is working. In situations where there is very little interface between a prime contractor's tasks and his subcontractor's tasks, it is

Ralph J. Stephenson, P.E.
Consulting Engineer
323 Hiawatha Drive
Mt. Pleasant, Michigan 48858-9096
phone 1 (517) 772 2537
e-mail ralphjsgte.net
December 31, 1999

possible that ownership of self contained float may remain with the subcontractor.

5. Ownership of float time does not release a contractor from the obligation to provide a high quality service to the client. Where poor use of float time to the detriment of the job is encountered, fault for the poor performance will usually temper the ownership of the float.

* * *

In general most problems with float occur where approval delays are encountered, where intermediate project dates are not specified but are desired and imposed, when poor performance pushes tasks beyond scheduled end dates, or where uncontrollable obstacles to meeting project contract obligations appear.

Ralph J. Stephenson, P.E.
Consulting Engineer
January 7, 2000

Dear Construction University faculty:

Below is our second offering (CU #002) in the Construction University curriculum. In this essay we're examining just how many people you can directly manage.

Control of the span of management is one of the largest and most serious problems encountered by the emerging manager. He or she so often feels able to manage the world, but, in truth and practice, these individuals are delegating that operation to those within their span of management who they can influence most effectively. That span of management can be anywhere between six and thirty, depending totally on the amount of interaction expected among those being managed.

Let me know what you think about this...write me if you've experienced it yourself. Those other Construction University students (an elite group) receiving these essays might well like to hear your story. Send it to me and we'll see what happens. ...After all Construction University is the locus of common sense !

Cordially and sincerely,

Ralph J. Stephenson, P.E.

Span of Management

-- 1299 words
-- Reading time approximately 6 minutes

December 30, 1999

Carrie is a very bright lady, a university graduate with writing, publishing and management skills and aspirations. A year ago Carrie accepted a very responsible position with Xeno Development. Xeno is an international urban planning, design and construction firm specializing in the development and ownership of integrated commercial enterprises and related sports facilities.

Her immediate superior, Helen Ralon, vice president of staff operations, immediately spotted Carrie's talents and gave her a clearly defined departmental management assignment including responsibility for publishing the monthly Xeno newsletter for commercial and sports facility owners. Current staff of the department in addition to

Ralph J. Stephenson, P.E.
Consulting Engineer

Carrie was two full-time writers, one proof reader/graphic designer and one computer operator.

Carrie quickly assembled this group into a effective team whose performance was good enough to lead Helen to add another supervisory task to Carrie's assignments -- preparing all proposal letters for presentation to prospective clients. Carrie was delighted by the challenge, and soon hired, with Helen's support, two additional engineering and architectural professionals to provide technical strength to the operation.

About seven months into the dual newsletter/proposal management assignment, Helen noticed some signs of weariness in Carrie but still no lack of enthusiasm for her job. Carrie was also beginning to do a great job of public relations of the firm. The marketing manager asked Helen if he could temporarily borrow Carrie to spearhead the upcoming negotiations for a very large five year development.
Carrie's new assignment involved responsibility for seeing that the work of two estimators, one architectural designer, and one more cad operator were properly meshed into the negotiation timetable and presentations.

Helen soon noticed that Carrie was spending more overtime, was looking tired and harassed; she also was losing her normal good natured rapport with others. Most seriously, her work quality and management abilities were visibly deteriorating.

After some serious thinking, Helen decided Carrie's problems might stem from a too-rapid and too-large expansion of her span of control. This very common ailment affects many managers today, and the failure of them and their superiors to recognize the problem is often the cause for promising careers ending up in frustration and failure. Continued later. As to the details - read on!

Span of management can be defined as the number of people whose activities you are able to manage and supervise by relatively continuous contact. Relatively continuous contact is direct communication on a day-to-day basis that allows you to evaluate performance at desired and needed intervals. Usually, direct management implies a closely spaced geographic relation to those being managed.

The main factors that influence an effective span of management are:

1.) The degree of need for those you manage to communicate with each other.
2.) The amount of time required to be spent by you with each of those you manage, and

Ralph J. Stephenson, P.E.
Consulting Engineer
January 7, 2000

3.) The effort required of you by your subordinates to assist them to work well with those outside your direct management system.

If there is a large degree of intercommunication between those you manage with each other, and with you, an effective span of management is usually limited to from four to six persons. Where there is little or no intercommunication among those under your direct management, you may be able to manage 20 to 30 people. Such a number is not arbitrary: many years ago social scientists studied Sear's stores' middle management. The Sear's researchers found that where department managers had little if any contact with each other that store managers could properly handle the responsibility for as many as 30 of these isolated managers and still be profitable and effective.

The number of links between subordinates determines how complex is their management structure. If you have four subordinates reporting directly to you and there are no links between or among the subordinates, the number of two-way communication channels in the system is four, one for each of your subordinates to and from you. This requires management of 4 x 2 = 8 relations -- well within the capabilities of even an inexperienced manager.

If two-way links must be maintained among you and among your subordinates within a managerial span of control of four, you are now managing 20 paths. Still not too many, provided any one link or set of links does not require excessive time.

As the number of participants increases the number of two-way communication links rises rapidly. For a manager and six subordinates who are totally linked the number of two-way links is 21 and the number of communication channels is 2 x 21 = 42. If you move to total linkage for 10 subordinates the number of full communication channels is 110, a number very difficult for even an experienced manager to handle.

If you are managing 20 people with links limited to one from them to you and none from them to others, you are only managing 20 x 2 = 40 communication channels. If you must manage total linkage among 20 subordinates you will find yourself trying to keep in touch with so many communication channels that you never can gain permanent control of the management process.

The span of management has many historical precedents that have repeatedly proved the difficulties in trying to directly manage too many people. One of the earliest examples of formal span of control analysis is found in the Bible. Exodus 18:12 - 27 tells of Jethro warning his son in law, Moses, that he has stretched his span of management too far and is in danger of losing control of the Exodus mission, leadership, and quality.

Ralph J. Stephenson, P.E.
Consulting Engineer
January 7, 2000

Military management for thousands of years has proven that careful attention must be paid the span of control to maintain safety and effectiveness of troops being managed.

Today's managers in all fields of construction (for example Helen and Carrie in our case study) find their span of control measurement is far more complex than that of the traditional internal manager. This is primarily due to the need for the manager in construction to be responsible for, and have authority over, many parties outside the organization. In addition he or she often does not have strong, well-defined, formal organizational clout and must exert direction through technical excellence, persuasion, fairness, firmness and good judgment.

This is possible for the experienced and excellent manager, but is hardly ever achieved by the emerging manager without help from his or her superior management staff and the company executive staff.

Keeping the span of management to a controllable size is the responsibility of both top and middle management, both the managed and the manager.

* * *

Now for one and a half solutions out of many -

By all means, Helen--an experienced manager--certainly realizes what's happened to Carrie. She sits down and explains it to her--Carrie, as a new manager, has seen all the warning signs of impending trouble but interpreted them as her own failing; in response, she was taking on more and more of the responsibility and had begun to micro manage. Helen shows her how things started to come unraveled and then they set about together to fix the problems.

Carrie needs to groom one or more of her subordinates to manage some of Xeno's operations, allowing Carrie to be most effective on the heavy-hitting projects while permitting her to keep her hard-won authority (and responsibility).

In the span of two months--through mentoring and informal meetings--Carrie's span of control is well balanced, there's a new manager in the company (under Carrie, and the light and heavy work is getting done more effectively. At their most recent meeting, Helen told Carrie how very proud she was to be working with her. They both got nice bonuses at year end and Carrie is looking at management as an ongoing career possibility.

Ralph J. Stephenson, P.E.
Consulting Engineer
January 19, 2000

Dear member of the Construction University:

The following essay is the result of my participation in a seminar by the Michigan and Detroit chapters of the Associated General Contractors, entitled AGC Student/Contractor Awareness Night (SCAN) in October of 1999. My friend Dick Brunvand of the Michigan Chapter of the AGC asked me to expand on my panel comments. This brief essay is the answer to his request.

As always, the materials from the Construction University are for your use as long as that use is intended to benefit the professions. It would be nice, too, if you give the various authors credit as you reuse these materials.

Ralph J. Stephenson, P.E.

Ethics in the Design and Construction Industry

by Ralph J. Stephenson, P.E.

1405 words
approximate reading time = 10 minutes

Are you ethical? -- Am I ethical? -- Are they ethical (and who are they, anyway)? The professional designer and constructor face these questions and dozens of others related to behavior day in and day out. We'll assume you are ethical and let's assume I am, too. But do we mean the same thing? Will we use the same criteria in an ethical situation that involves both of us? Can you see the need for both of us to share a definition?

Confucius said it very well:

"If language is not correct, what is said is not what is meant: What ought to be done remains undone: Morals deteriorate: Justice will go astray: And the people will stand about in hopeless confusion."

Civilizations and their disciplines of good, evil, moral duty and standards of conduct, commonly called ethics, are faced ultimately with hard decisions about what they believe in and what they wish for the future. Similarly, the design and construction

professions face the need to transfer into words and deeds what is healthy to believe in and what is healthy to do. A very simple anecdote illustrates the principles of proper behavior in a startlingly clear mode as presented in the world of words. Let us call this story the "Case of the Invisible Sprinkler Lines."

A young journeyman sprinkler fitter named Fred, just 22 years old, is working on a medium-sized school job in Lansing, Michigan. Fred's approved shop drawings show a sprinkler main running above the ceiling from the riser to the branch line in a small, enclosed storage area on the first floor. Two sprinkler heads are to be located in the storage room.

Fred has found sheet metal ductwork and water piping that interfere with this line, making it difficult to install without redesigning the sprinkler distribution system. Fred flags down George, his supervisor, and asks him what to do. George, a seasoned tradesman and field manager with almost 30 years experience looks over the situation and tells Fred -- 'forget the runs and just install dummy heads in the storage area after the ceiling is in. Nobody will notice it or check it anyway. Arguments with the owner, the architect and the engineer about who's going to pay for correcting the interferences aren't worth the trouble it'll take to resolve the problem.'

Fred disagrees but does not have time to voice his feelings because George is already on his way to another job.

The president of Fred's company, Tom Halstead, happens to be at the project for a job meeting. Fred sees him some distance away as he is told by George to ignore the interference. George has left the area without seeing Mr. Halstead, and the president is walking toward Fred, obviously with the intent of saying hello and seeing how things are going.

Many thoughts are flying through Fred's mind:

What should I say, if anything, to Mr. Halstead about the sprinkler heads?
How can I justify any course of action to George?
What will the guys on my fitter crew think of me?
What will my family think of me?
What will be my opinion later about my action today?
Am I in the right business?

This, in miniature, is what many of us encounter as we try to make ethical, moral, and civilized decisions about the problems and temptations facing us in our personal and

on-the-job lives.
There are some easily applied systems that can help you arrive at quick but sound ethical decisions. For instance, the three-question technique proposed by Kenneth Blanchard and Norman Vincent Peale in their book *The Power of Ethical Thinking* suggests you answer three questions:

1. Is my decision legal?
• Does it violate civil law or company policy?

2. Is my decision balanced?
• Is it fair to all concerned in the short and long term situation. Does it avoid sum-zero situations? (In a sum-zero situation there is a winner and loser with the winner taking everything the loser loses.)

3. How will my decision make me feel about myself?
• Will it make me feel proud?
• Will I feel good if it is published in the local newspaper?
• Will I feel good if my family finds out about my decision?

In Fred's situation the legal answer is apparent. Doing what his superior, George, suggests is clearly a violation of the law and probably of company policy. Further, a decision to install the dummy heads is a disservice and a danger to those who must occupy the completed school.

Installing the dummies creates an automatic adversarial situation in which there are losers: those using the building and depending on the life-safety systems. There are dubious winners: the contractors on the job. There is another loser, Fred. He will probably lose his job unless he can think of a way to a winning solution, one in which all parties win.

The third consideration is more complex and personal but is probably the easiest to answer. Your feelings are best known to yourself, and your answer will mirror your ethical capacity to exist in a working group that values a high trust of others in that group.

We have seen in the sprinkler story an example of the formal ethic where Fred's refusal to install the dummy sprinkler heads is readily recognized as ethical by the law and by well-accepted standards of good conduct.

Blanchard and Peale are superb as far as they go, but for those of us in the construction

professions there is yet another form of ethic: paramount respect for public health, safety, and welfare. As an illustration consider a situation where life safety is at stake and you must make decision in which only the end result is the measurement of ethical performance. For instance, suppose that you, as a project manager on a busy highway job, must suddenly shut down a critical interchange at morning rush hour due to an unexpected gas leak. The end result -- a safe journey for the users -- will be the final criterion of ethical action, rather than the shut down and its delay to motorists at the start of the work day.

In our second example above situational ethics determine what rules of law and behavior can be safely broken to arrive at course of action that at its completion is considered ethical. Here is where professional designers and constructors must be at their best. Perhaps the most reliable and straightforward ethical guidelines I have received were those given to me many years ago by Clement Freund, Dean of Engineering at the University of Detroit. I had asked for his guidance in considering a structural design revision that in my opinion could be safely done, but would possibly violate a required code. He told me about a simple test of ethical priorities, and how to apply it to actions that must be taken as we make ethical decisions. "Your actions", Dean Freund said, "should be given the following order of consideration:

- Your first priority is -- to protect the health, welfare and safety of the public.
- Your second priority is -- to protect the interests of your client or employer.
- Your third priority is -- to protect the interests of your peers.

Although there may be no single acid test of ethical, moral, and civilized behavior, the considerations outlined above certainly contain the essence of generally accepted civil and professional action to achieve such behavior. Their incorporation into your thinking and reasoning in design and construction matters will give you added confidence in the validity of your design and construction choices.

Ralph J. Stephenson, P.E.

Ralph J. Stephenson, P.E.
Consulting Engineer
February 4, 2000

To Construction University faculty

CU#4 is an introduction to a management skill needed by professional planners, designers, and constructors. As usual, we welcome your comments and suggestions.

Regards,

Ralph J. Stephenson, P.E.

USING INTELLIGENT QUESTIONING

by Ralph J. Stephenson, P.E.

-- 1,623 words
-- Approximate reading time - 8 minutes

(Every man and woman is satisfied that there is such a thing as truth or they would not ask any questions - paraphrased from Charles Sanders Peirce)

Over the years I have been impressed by the amount and quality of information some professionals in the design and construction business are able to acquire in a very short time. After much watching, listening, reading and thinking I have concluded that this information is a direct result of their use of a talent...the talent of intelligent questioning. Part of this talent grows out of a sincere interest in what others think; the other part is learned.

The sincere interest portion of questioning must be acquired by a belief that what others know can add value to your professional responsibilities to society, your clients and your peers.

The learned part of acquiring quality information requires an understanding of the power of various kinds of questions. An actual example might illustrate how important it is to know the types of questions you can ask and how they are

used.

The Case of the Closed Question

This event happened several years ago on the construction of a large discount store in Chicago upon which I was engaged as a consultant. My responsibility was to regularly inspect, evaluate, and report on construction progress of the job to the owner.

The general contractor's field superintendent on the job, Linton (not his real name), was originally a farmer, and a good one. He had earned an architectural degree from an excellent Midwest university and had received his professional architectural registration. Linton had learned, as do many farmers, to keep his mouth shut except when he added value by opening it.

I came to the job about nine o'clock in the morning and checked in at the field office. Linton was occupied but told me to go ahead and tour the job and he would catch up later.

Site grading was in work for a major share of the parking areas and the foundations for the building were substantially complete. I noticed that building work and site grading were meeting planned dates between early and late starts and finishes. However, several trenched utility excavations were standing open and empty.

It was not a serious schedule problem at the time, but with wet, cold weather in the forecast, the open excavations might force a site-work cost overrun for my client.

Linton caught up with me just as I was heading back to the shanty to review job progress with him. On our way I asked--"Linton, do you have all your building permits," knowing that Linton, an honest person, would quickly explain why he wasn't installing site utilities in the open trenches. However, Linton responded with a terse one-word answer: "yes."

This puzzled me because normally our superintendents, including Linton, worked very hard this time of the year to get their site underground work completed as quickly as possible.

Ralph J. Stephenson, P.E.
Consulting Engineer

I was disconcerted at what I thought was less-than-honest answer and it showed in my face. Linton, both a perceptive and conscientious man, was concerned at my lack of acceptance of his explanation and clammed up until we arrived at the trailer. Once in a warm and relatively comfortable work place, I said to Linton, "If you have all your permits...and knowing from my inspection that you have the underground pipe and conduit on the job...why aren't you installing the parking lot utilities in those open trenches?"

Linton told me quickly and impatiently that I had asked him if he had all his building permits--not all of his construction permits. He said he did have a full building permit, but that his site work permit was still pending and would be available later that day.

So, Linton felt that he would have been lying--and rightly so--if he had told me he didn't have the building permit.

The lesson learned: Don't ask the Lintons of this world a yes or no question unless you are totally satisfied that a yes or no will provide you with all the correct information you need. Linton had given me a right answer to a wrong question.

Questions stimulate the mind. Most active, interested people love to answer a question because it gives them a chance to think constructively about situations. To use questioning as an intelligence tool we, as design and construction professionals, must understand that although there are fifteen or twenty kinds of questions in common use, most of these are either open or closed. This two-part division gives us a basis for effectively formulating almost any question we choose to ask.

Let us begin our discussion with a few fundamental definitions.

A question is a brief sentence in an interrogatory form addressed to someone, and is designed to elicit information.

*A closed question is one that can be answered with a yes or no, or with a simple statement of fact:
- Are you going to the committee meeting tonight?
- Is the structure concrete or steel?
- I hear a large crowd is expected at the basketball game. Is this true?

Ralph J. Stephenson, P.E.
Consulting Engineer

The closed question is valuable in opening a line of inquiry. It can be used to narrow down a group to those individuals who probably know something about a particular subject.

* An open question is one that cannot be answered with a yes or no, nor with a simple statement of fact:
- What is the best approach to inspecting and monitoring the project?
- How do you open this word processor?
- Why do you want to bring the utilities in from the south?

The open question is best used to encourage those responding to a closed question to further elaborate on their knowledge. It is a valuable tool with which to build a meaningful discussion base and to zero in quickly on the details of a topic.

The Soccer Program

Fred Thompson, the program manager for a sports-facility developer, is meeting with a working group of fifteen people from various architectural and engineering disciplines. They are about to begin discussions of the project-delivery systems available for a proposed soccer complex. Fred wants to quickly locate those in the meeting who know something about writing narrative programs about sport facilities. He asks a closed question: "Who in the room has experience in writing narrative design programs for sports facilities?"

Notice the question is devoid of specific details. Instead, Fred has allowed the audience members to provide their ideas about what he is asking. This stimulates the group to supply their own interpretation about what Fred wants and to give answers that will help direct the discussion into more specific channels.

Lisa raises her hand, answers "yes" to Fred's closed question, and begins to converge the discussion by asking Fred another closed question: "Are you looking for experience with interior design narrative programs for facility support areas?"

Others who answered Fred's opening question are now also asking both closed and open questions to further narrow down what it is that Fred is really trying to find from the group. At the same time, Fred is gathering information about the people who will probably prove valuable as he makes design-team

management assignments.

When formulating questions we should distinguish clearly between various types of closed and open questions. To set the stage for further discussions of intelligent questioning, I have defined below some sub definitions that may be formatted either as closed or open inquiries.

a. **Ambiguous** - questions possible to interpret in different ways:
* Do you like this job?
* What are your career objectives?
* How many sections do you use in your specification format?
* Who owns small tools at the end of the job?
* Where is this specified?

b. **Closing** - questions that cut off or freeze the discussion temporarily or permanently:
* Is that your best price?
* Their proposal includes several options we want but you have excluded - can you match the options?
* Take it or leave it--ok?

c. **Direct** - questions with a strong indication who should answer:
* What does the group think about design/build? Tony, how about you?
* Here's a question that probably should be answered by a safety expert. What do you think, Hal?
* Is this a code problem, a design problem, or a construction problem?
* How do our clients feel about chemical environmental issues?

d. **Directive** - specific questions about specific issues:
* What quality of graphics do you want to use in this presentation--high, medium, or sketch level?
* What do you mean when you say we should start our cost estimates by figuring the "must" items first?
* Are you aware of the business risks you are taking with our client by using iterative costing with a guaranteed maximum price?
* When did you first realize how good that glass system really was?

e. **Indirect or overhead** - asked of a group without indication who is to answer:
* How do you approach the problem of governmental restrictions on the type of project delivery system your division can use?

Ralph J. Stephenson, P.E.
Consulting Engineer

* How has the use of commissioning improved your project costs?
* What type of management organization has proven successful in your respective offices?
* How do you prorate equipment rental costs?

This is by no means an exhaustive list of the types of questions that are out there and there will be more to follow in the next Construction University paper.

As always, your input and questions are welcomed! I'd especially like to hear about any times when your questions led to...hmmm...interesting answers. Remember to change the names of all the parties.

Here are some references I suggest if you want to know more about questions and questioning:

Smart Questions by Dorothy Leeds - McGraw-Hill Book Company

The Nine Master Keys of Management by Lester R. Bittel - McGraw Hill Book Company

Give and Take by Chester L. Karrass - Thomas Y. Crowell Company.

The Gap
CU Essay #005
Written by Phil Bennett
Edited by David Schock , PhD

Ralph J. Stephenson, P.E.
Consulting Engineer
February 26, 2000

Dear Construction University Faculty:

Here is CU #005--The Gap, written by Phil Bennett of the University of Wisconsin. Some of you are familiar with Phil through classes you have attended there and others of you may recognize the name through the many flyers you get from WEX. Phil is an outstanding educator in the design and construction disciplines and probably has conducted more successful and meaningful seminars for design and construction professionals than anybody else I know.

He and I have been looking at the makeup of our classes at the U. of W. for many years and we agreed about four years ago that Phil should write a paper with his views of a peculiar phenomenon--the existence of a hole in the age spectrum that had certain characteristics, and, within some groups, had produced a vacuum in information transfer. You can read all about it below.

The essay is long and meaningful, meant to be read at your leisure. And, naturally, we hope you will send your comments.

This essay is the fifth in the Construction University series. If for any reason you did not receive and want any of the earlier mailings, just let me know. Here's what we've sent so far: Float Time (CU #001), Span of Control (CU #002), Ethics (CU #003); and Using Intelligent Questioning (CU #004). As well, if you would like to address an essay to this audience of dedicated professionals, drop me a line.

Cordially,

Ralph J. Stephenson, P.E.

The Gap
CU Essay #005
Written by Phil Bennett
Edited by David Schock , PhD

Ralph J. Stephenson, P.E.
Consulting Engineer
February 26, 2000

February 21, 2000

The Gap - Are We Educationally and Experientially Preparing the Construction Industry for the 21st Century?

by Philip M. Bennett

Architect and Professor
Department of Engineering Professional Development
University of Wisconsin

-5,338 words
-Approximate reading time = 25 minutes

The construction industry is presently undergoing a change in the experiential backgrounds of many of the members of its professional work force. U.S. demographics and insurance studies show that as we neared the year 2000 approximately 60 percent of the experienced work force in America would be retiring.

The legendary construction professionals who had many years of technical skills are now retired or retiring. The magnitude of the knowledge base being lost to retirement has yet to be realized. Many individuals who are retiring after 40 or 50 years of experience will take with them several critical areas of information necessary to maintain continuity and the integrity of the departments that they leave.

Their leaving has created a void...a gap. Somebody--many somebodies, actually-- have to fill it, but how can we remedy the lack of preparation that accompanies new members of our fields? Even more serious, there is now a lack of people in the 35-45 year-old age range...a time, traditionally, when many construction professionals were moving into middle management. It is these people who would have been training new entrants to the professions and these same people, historically, would be getting

ready to take over the upper management tier.

A host of issues--the high costs of construction, limited time for training, and larger construction demands--have opened this gap and it's up to us--those of us who are not yet retired (even some who are but remain active in the professions) and who can see the problem--to address the issue. My hope is that everyone in the construction industry will reevaluate organizational and individual deficiencies and then direct training efforts toward improving industry performance.

The Problem

The gap hasn't happened all at once. We've been watching during the past twenty-five years as economic and time constraints have pushed many organizations and companies to place less emphasis on training and mentoring to replace a growing number of retirees. Add to all that, with the onset of downsizing, rightsizing, and company buy-outs, many individuals have been forced into alternate career paths that have limited the depth of experience they might have gained by staying in just one position. This fragmentation in training has produced large numbers of individuals who have limited skills in the specialty and general areas needed to satisfy the needs of the construction industry.

Major changes in construction and related manufacturing sectors in the 1980s have further reduced the number of midrange-age individuals in the work force. As a result, middle management has been decimated. We now are feeling the effects of limited leadership to take over many organizational programs. There is little discernible leadership continuity in the overall work force coming from the Gap Group -- and that's something we desperately need.

Let's start by taking a closer look at the reasons we face this problem:

Abandoning Training Programs

Day-to-day training, education, and experiential opportunities are essential to keeping and maintaining a high level of performance in our nation's work force. Over the past several years, specialty programs like construction specifications writing, preparing high-quality working drawings, and other technical skill areas required to produce usable construction documents have been dropped from the training curriculum.

Seemingly, organizations are no longer willing to train individuals in the basic skill areas required for success of their projects.

As we've seen a downturn in training numbers, we have also seen an increase in the number of construction problems and deficiencies resulting from poorly organized and inadequately written legal documents. Basic technical skills are still required to successfully solve construction industry problems.

Automation Technology

During the mid-1970s and through the 1980s, automation technology was implemented in a number of organizations and companies across the U.S. As the automation world developed, more and more companies became proficient in many applications associated with their production activities. The automation world became a part of everyone's life and proficiency and production has increasingly affected the overall structure of the work force.

As a result, individuals working in management down through the production staff have been affected by the increased capabilities needed to deal with larger scale projects and production demands. The overall size of the work force began to change in profile and numbers causing impacts on middle management.

Economics

During the past 15 years, many organizations and companies have been faced with cutting overall production and operational costs. The need to reduce costs has greatly affected the work force and many individuals in upper and middle management. Realigning staff to meet production needs while cutting costs has tended to decrease the number of individuals in the middle-age range of the work force.

Company Downsizing and Rightsizing

In an effort to reduce production costs and realign with public needs, many companies have been downsizing in an effort to cut costs in addition to realigning their staff to meet overall demands.

For some organizations, this has been termed as a process of rightsizing the production staff to meet the goals of the organization while serving the overall marketplace. These

company actions caused many organizations to reduce middle management and, in some cases, upper management, which resulted in a lack of continuity of age range within the work force.

Company Acquisitions and Mergers

To face the world of competition, many organizations have moved into merger and acquisition positions in order to absorb the competition and reduce production costs. These kinds of moves have cost jobs in many different disciplines found in both the private and public sector. When one organization absorbs another it tends to reduce the work force in the middle management and middle-aged range, and may take out the continuity of experiential development within an organization. As a result, we have few people in the age range from 35 to 45, and a pressing need to hire many young people.

Specialization

As our world has become more complex, many disciplines have become more specialized. Larger projects, more sophisticated automation technology, construction technology change, and the overall demands for production have created a demand for individuals who specialize in their educational and experiential development. An individual no longer comes into an organization and works through a whole series of areas before reaching a high level within the company. It is now difficult to find individuals who understand a process from beginning to end; that's a radical departure from past practice.

Worker Mobility

During the past 15 years, many changing job opportunities and downsizing have caused the work force to become more mobile, thus producing fragmentation of learning experiences. One now finds very few individuals who have had a long-term continuity of learning within one organization. Individuals tend to spend only a few years in a particular learning experience before moving on to some entirely different job. Such mobility amplifies the fragmentation of experience. The gap in educational and experiential backgrounds is increasing at a rapid rate because of mobility and limited job tenure opportunities for continuity in the organizational structure.

Temporary Attitudes

We no longer find organizations that have a family-type work force of long standing. Tenure on a job tended to strengthen the quality of production--the overall attitudes being positive and the final product one that pleased the public. Many individuals have acquired an attitude that "I'm only here for a short time, so my experiences will be limited by my exposure to the company or organization." These attitudes tend to decrease the valuable experiential gain from exposure to limited processes within the organization.

As a result, the depth of knowledge on an overall process or production activity will be very limited and not well understood. This process tends to result in a "Who cares?" attitude and, therefore, we find many companies with a work force that is not strongly aligned with the overall goals and objectives of the organization.

Limited Time to Apprentice or for Mentoring

With organizational goals focusing on reducing costs, reducing time, and reducing staff, one finds no real concentration on mentoring or having individuals apprentice under an experienced professional. Efforts to cut costs have also reduced the emphasis placed on training people properly within the organization. Combined with the "Who cares?" attitude, we have individuals who are in and out of organizations with no real alignment or goals that produce stability. In many cases, companies have the attitude that "Once we train the individuals or invest money in their educational background they will leave and move on to other opportunities."

As a result, we find many companies and organizations that are constantly dealing with new people to train who have limited backgrounds and understanding of overall organizational goals. When the individuals in the work force reach a certain point, they decide to quit and move on to another organizational structure thus causing major gaps within the continuity of the work force. Production goes down while the quality of the product also goes down. The customer ends up the loser.

Organizations Changing from Long-range Planning to Short-range Planning

During the past 10 or so years, many organizations have altered their planning process from long-range to very short-range, and, in many cases, day-to-day.

This shift results in reduced training, reduced employee allegiance to the organization, and undermines the good features of longevity. Many individuals know from the

outset that their jobs will only last as long as the projects are funded. With many organizations working on a project-by-project basis, it tends to cause a fragmentation of the learning process and produces a sense of insecurity on the part of the worker.

Changing from a Corporate Attitude to Self- or Individual Fulfillment

As we go back in history, we find many organizations with employees who had a strong corporate attitude and feeling toward their company. The Gap attitude is often one purely of survival and focused on one's self rather than the corporation.

In a survival-work environment, there is little thought given to training and experiential development since there is a major lack of security. The survival attitude in today's work force has helped to cause many gaps in the experiential and learning environment that is so critical in developing strong organizations. As a result, we find many people having to spend time filling in the gaps and covering for individuals who lack the experience or the backgrounds necessary to fulfill their job requirements.

No Continuity in Age or Experience

In surveys taken informally at recent professional development courses, participants have verified that their organizations and others like them have a dwindling number of managers and workers in the middle age range of 35 to 45. As a result, companies are faced with a lack of continuity in experience and production capabilities. Many companies are forced to hire younger, inexperienced people to help cover for the many individuals who are retiring or who have already retired from the work force. The limited time for training causes a limited number of the work force to cover for those who have left with all the experience. The end result is production that lacks quality control.

Lower-Quality Leadership and Decision Making

Many organizations are starting to see the impact of their inabilities to respond to the level of decision-making and leadership necessary to maintain a successful operation. Both private and governmental organizations are beginning to face the same difficulties because the trend toward lower-quality leadership and decision making is increasing at a rapid rate. As a result, production costs and project development mismanagement are causing many projects to get out of hand early in the development stages.

Ralph J. Stephenson, P.E.
Consulting Engineer
February 26, 2000

Reduction in Historic Information Database with Less Emphasis Being Placed on Historic Experience

Lack of continuity in the work force, a loss in the experiential base through retirement, and the mobility of the work force have caused many organizations to place little emphasis on the historic database necessary to make improvements and refinements to their overall production process. The expected results can be more trial-and-error decision-making activities, greater risk to the owner-clients, and repetition of many mistakes. The end result will be higher costs, lower quality, and reduced fulfillment of user needs.

Surveys have shown that few organizations are taking advantage of their history...that is, using their historic data as a basis for decision making. Lacking a strong information database will create major gaps in training and experiential backgrounds of their employees (especially new employees). The weakness in limited informational databases of historic data will result in higher cost decision-making while at the same time increasing and magnifying the risk of poor decisions being made.

Segmental Learning and Experience Due to Frequent Job Changes and Limited Exposure to an Entire Process

Long-term benefits can be gained by providing solid career-path training opportunities that expose individuals to many dimensions of an organization's operations. As identified earlier, many individuals are managing specialized projects, tasks, and activities that limit their overall exposure to a process or an entire project, and keep them from fully developing their career potentials. With fewer training and mentoring opportunities, many individuals are left to develop skills on their own and with inadequate guidance.

As a result, many companies face more down time in bringing new people on board and in bringing them up to speed in their job performance. Therefore, it is becoming very important to develop career-path training and good exposure to field mentoring in an effort to reduce training costs while improving the future production from the employee.

Fewer Educational Programs

To complicate things further, many colleges and universities have either dropped or

altered their career development programs that were considered basic and essential in maintaining skill levels. With a lack of continuity in training, hiring and developing career-path programs, the nation will be faced with increasing cost to achieve the quality expected by the general public. Random surveys in professional development programs indicate the gap in age range and experience hinders continuity in expertise.

Informal class surveys of professionals in many fields and representing many different industries have indicated a major gap in the age range of their employees and also in the experience base for future leadership. Fellow workers and employees agree that the United States is facing a major problem in developing strong continuity in leadership and decision making because we do not have good continuity of training within most organizations.

How Do We Recognize the Problem?

How do you know if your construction-related firm is in the Gap Squeeze? There are three main areas you should examine.

Experiential Deficiencies

Are your projects getting out of hand? Are there to few people who know what needs to be done to bring the project in profitably? Are bad decisions being routinely made without being recognized?

Presently, we have fewer individuals in the marketplace experientially capable of picking up where many of the retirees have left off. Most organizations over the next few years will be faced with trying to recover experience by shifting personnel and bringing in younger people to be trained to close the gap presently being encountered across the nation.

With older generations retiring, the experiential level within an organization declines rapidly. This decline leaves many deficiencies in the potential for management, procedural activity, and overall technical experience to effectively solve critical problems. With a major gap in the middle-aged range and experience level, companies must search for younger people to pick up the slack, and in many cases, to bring back retired individuals as consultants. If not filled, the educational and experiential gap will cause the overall quality of decision making and leadership to decline rapidly.

Limited experience in the project management field has already caused many projects to get out of hand with very high cost overruns and major losses to owner-clients. We can attribute this to the decline in leadership and judgment that has accompanied the replacement of experienced project managers with those who are much less experienced. As a result of the lack of quality education and good experiential backgrounds, one finds the leadership and decision-making in question.

Deficiencies in Documents and Reports

Are your documents adequate to accomplish the jobs for which they were designed?

Surveys taken over the last several years in a professional development program focusing on contract documents shows a steady decline in the quality of these documents. The number of errors, deficiencies, and overall problems associated with many construction projects tends to be increasing rather than decreasing. Also, fewer people are able to judge whether documents and reports are sufficient; they just don't know! Our surveys have shown that this decline is continuing to grow at a more rapid pace as we move into the 21st century.

It is interesting to note that there appears to be a corollary in the ability of training in particular skill areas such as specifications writing and the quality control of working drawing development in the construction industry. Professional development programs on these subjects were presented for decades until there was a drop in demand in the late 1980s.

As these programs were dropped, there was an increase in the number of problems associated with development of construction documents the actual project construction in the field.

Profile of Age Ranges in Organizations and Departments

What does your work force look like on paper?

To better recognize the problem graphically, departments, organizations, and companies should profile the age range of their employees in addition to their experiential backgrounds. The information gathered through these surveys will provide a working base for determining the potential problems and gaps to be faced in quality leadership and decision making in their near future.

For those organizations that have already recognized the problem, they will have the advantage of an early recovery, which will allow them to still select from a greater resource pool of skilled individuals. Those organizations that have not recognized the problem and are hoping everything somehow will be resolved will face greater problems in the future because they will have fewer people to select from to create strong production and administrative programs.

What Can We Do about The Problem? How Can We Prepare?

We in the construction industry must become more active and creative in devising ways to minimize the impact of this wave of retirement among our experienced colleagues. As more and more individuals reach retirement age we need to place more emphasis on internal training as well as external training of those proposing to enter the professions. We need to focus educational activities on many different levels of technical training as well as building professional career programs that have been based on the experience of knowledge-rich retirees. Filling the gap and reducing the educational and experiential loss should be a high priority goal of all organizations.

We must undertake an all-out effort to improve training programs, mentoring activities, and co-op programs to provide educational opportunities. On-the-job training combined with excellent educational opportunities will help bring our nation's work force into a new alignment for the challenges we face in the twenty-first century. We must encourage a resurgence of interest and desire on the part of young professionals to become better educated and trained in how to do quality work.

Improve Hiring Practices to Encourage More Continuity in Age Range and Experience

To build stability back into our organizations, divisions, departments, and companies, we need to update hiring practices and organizational thinking to focus on developing an employee base that maintains continuity in age range and experience. Past hiring practices have focused on economics, downsizing, and rightsizing with little emphasis on age range or experience. It has been expedient in the past to simply hire staff on a project-by-project basis with no concern for longevity in career development. As a

result, many organizations suffer from discontinuity in age range and shallow experiential depth.

Improve Professional Development for Employees

With the creation and continuing existence of a gap in age ranges and experiential backgrounds for many company employees, it will become critical to use effective professional development training programs for extending and enhancing career path programs. Both in-house training programs and off-site training endeavors should be looked upon as effective methods to compensate for major losses in experiential skills from retirees and changing work flow patterns. Professional development programs can project younger employees into decision-making situations where they will be able to do a more effective job in a relatively short period of time.

Surveys have shown that an employee can be advanced three to five years ahead of his or her underdeveloped capabilities for problem solving simply by attending continuing education programs. Sharpening skills through both formal and informal training can add great value to an organization's experiential base. Professional development attendees have indicated that some programs can give them educational insights to help them solve problems that would have been far more costly to resolve if they had not attended a continuing education program. Personal discussions with employees and informal surveys have shown that companies active in internal and external training programs have generally operated with a higher level of success and have produced more quality projects than those who have not encouraged employee career development.

Improve Mentoring

With an increase in the number of retirees, it becomes critical to develop effective mentoring programs as early as possible to avoid damaging declines in the experiential base of a department or organization. Good mentoring programs can work effectively by teaming experienced individuals with less experienced individuals who have greater automation skills. This combination not only enhances the learning experience, but also saves training costs and improves quality production.

Careful planning and staff organization can create mentoring programs that do not reduce overall production or alter decision making, but, instead, enhance the end product through more effective working relationships. Teaming up a younger person with an older, experienced staff member can bring many benefits to the organization. It

allows the more experienced person to take advantage of the younger person's fresh technical skills and incorporate them into the problem-solving process. At the same time, this can better integrate the experienced individual's knowledge of the process and the overall goals established by the organizational structure. The exchange of ideas, the application of technology, and the extension of the younger generation's experience provides an overall successful learning environment that produces better problem solving, and saves time and money in the delivery process.

Improve In-house Training

In the future, more internal training will help organizations fill the educational gap and overcome many of the problems that come from potentially fragmented training off-site.

As a result of the current situation, some organizations are beginning to request in-plant or in-house training programs to bring staff members into a position where they can perform more effectively in a limited time frame. These special programs focus on critical task performance requirements and critical company demands. Benefits from in-house training appear to far outweigh the limited training of a few individuals being sent to off-site training centers. In particular, in-house training programs give rise to organizational representatives who become more effective team players as well as focus on the thinking process necessary to streamline many organizational structures.

The continuity of in-house training and employee participation in planning the program helps generate strong organizational goals and mission assignments. Several recent in-plant programs have demonstrated greater unity in carrying out work assignments to meet public demands through employee participation. This type of training has also often been accomplished at a lower cost to the organizations and departments involved in internal professional development.

Nor does all the in-house training have to come from outside: in many organizations, there are very talented people who have not been given an opportunity to conduct or present seminars or in-house training programs for the benefit of less-experienced individuals. Great opportunities exist for developing ongoing in-house training programs that build on experienced individuals' knowledge obtained through years of experience as well as from attending outside professional development programs.

It is also important to encourage those individuals given an opportunity to attend outside professional development programs to help build in-house training programs

based on their learning experience.

Team Up Experienced Staff with Younger, Inexperienced Staff

Complex demands of many of our design and construction projects require that heavy emphasis be placed on team interaction and decision making in an effort to maintain quality control. Organizations are beginning to recognize that the complexity of technology and the demands of current projects are requiring more and more specialists working in a team setting to solve complex technical problems. Organizations can exploit this situation by teaming up younger, inexperienced individuals with older more experienced specialists who can share good technical knowledge. This is not necessarily a mentoring arrangement, but it may well lead to one. Teaming also provides the opportunity for younger people who are more proficient and skilled in automation areas to pass on their learning experiences and knowledge to the less-skilled older generations.

Improve Teamwork Concepts which Share Experiences and Take Advantage of Specialists

It is important to realize when and where teamwork and specialization linked to effective training programs can enhance the quality and outcome of the project development process. Organizations need to evaluate their work and production environments to determine how they can most effectively share experiences and create mentoring settings. In many organizations, the internal competition becomes so great that it may destroy the potential for interchange or effective mentoring programs. In those situations, it is important for the organizational development program leaders to recognize when and where they can build in internal training and have it count toward the output or product of the individual responsible for mentoring in-house personnel. More programs need to put an emphasis on building strong training programs and in-house mentoring efforts that can be evaluated in performance measurements for employees.

Improve Cross-Training Skills

Cross-training programs allow individuals to develop skills in more than one specialty area. Individuals who take part in cross training are generally able to enhance their career opportunities as well as improve their earning power by becoming more

valuable to their employer. Cross training also allows individuals to cover for each other during vacations and employment declines as well as handling peak loads where multiple talents are required. By creating cross-training programs, organizations can reduce the impact of losses through retirees and provide cover for individuals who are absent from the middle-age range of experiential backgrounds.

Develop Training and Operational Manuals

With a rapidly declining experiential base, it is becoming more critical to develop effective training manuals and operational manuals to allow younger employees to better understand the process and the requirements to achieve high levels of success when fulfilling public demands. In many organizations, continuity of procedures and standard operational guidelines must be adhered to in order to accomplish the task.

Surveys of most successful organizations indicate that they have developed organizational missions and objectives that are a starting point for effective procedural and training manuals, which, in turn encourage uniformity and continuity in delivering their services.

The development of effective operational and training manuals can be the beginning of a strong educational development process. Good manuals and procedures will enable younger employees to better understand the company or organizational program as well as the standardization required to maintain specific levels of production and quality. Training manuals are especially important where projects rely on critical decision making through a series of problems whereby experience can be captured and transferred to younger team members. Case studies, good examples, things-that-work manuals, and quality decisions for specific problems can enhance the training potential for new employees.

Develop Databases with Useful Historic Information

Automation technology can now provide a more-effective framework for storing historic project information. Valuable information collected from case studies, successful projects, and good problem solving situations can be captured and stored for easy retrieval. To build consistency and good decision making in future projects, organizations and departments need to place greater emphasis on reusing historic information for planning and implementing projects. With major gaps in experiential backgrounds and continuity of employment, it has now become imperative to rely on good historic information collected prior to individual retirements. Historic databases

can provide valuable information for project start-ups, thereby reducing costs, time, and labor resources while maintaining quality decision making.

Use Former Employees as Training Consultants to Improve Quality of Decisions and Project Review

As we move into the 21st century, departments and organizations need to consider the avenues available for training, project review, and effective leadership for decision making. One route is to use former employees as trainers or training consultants to maintain professional development within an organization. In many cases, lower-cost mentoring or education can take place by rehiring a former employee to watch over and guide younger individuals in their career paths

It is important to consider the use of consultants or former employees for project reviews and construction-document reviews in an effort to reduce potential problem areas. Outside consultants and specialists can help to reduce the impact of the gap or loss in experiential information due to retirements.

Develop Review Teams to Check Projects and Quality Control

An effective means for quality review checking can be developed by selecting skilled individuals to work as a team in monitoring production and final checking of project execution. Most organizations have key people who can add great value to the project by incorporating their knowledge base in establishing project delivery methods. This form of review can be the most cost-effective method by which to add value to the employee's contribution to the organization. The benefits derived from properly using skilled individuals can be realized in the checking process through the reduction of risks.

Phil Bennett, 2000 --

Philip M. Bennett is a registered Architect and a Program Director in the Department of Engineering Professional Development at the University of Wisconsin in Madison, Wisconsin. He has worked in all phases of engineering education and training at the University since 1967. During this period he has developed and maintained more than

Ralph J. Stephenson, P.E.
Consulting Engineer
February 26, 2000

400 continuing education programs and research projects.

Under his direction, annual continuing education programs have been developed and presented on working drawing production, CADD management, specification writing, construction contracts, construction inspection and field administration, project and construction management, housing and building inspection, planning and zoning for community land use management, effective zoning administration, integrated mining and land reclamation, and design of functional research and development laboratories.

Ralph J. Stephenson, P.E.
Consulting Engineer

March 28, 2000

Dear Construction University Faculty:

Our newest Construction University essay entitled "Closing Out A Construction Project", is presented below for your use and most particularly for your comments. For several years I have been collecting design and construction project and program close out items from experts like yourselves in the planning, programming, design and construction professions. I would like to take advantage of your knowledge and experience as a generic construction practitioner to sharpen up the list in the essay below and to add to it the new terms now used in our vocabulary, in our classrooms, in the field and in the drafting rooms of our design offices.

Please take some time as it becomes available and give me your comments, revisions and additions on the list below. I will, in turn, try to incorporate your suggestions in future Construction University materials.

Look for the next CU essay in the near future.

Regards and good luck (with a dash of skill) in closing out your next project.

Sincerely yours,

Ralph

Closing Out A Construction Project

A random summary of close out guidelines for owners, architects, engineers and contractors

By Ralph J. Stephenson, P.E.

-- 1,372 words - approximate reading time = 9 minutes

The process of closing out a construction project has emerged as one of the most important sequence of events a project team may encounter during the course of the project. Reasons for this are:

- The close out process usually results in a formal and legal acceptance of the

facility by the owner or occupant. Thus responsibility for the correctness of the work passes from the design and construction team to the owner. The transition must be clear and indisputable to avoid contested claims and residual obligations.

• The conditions imposed by the warranties on workmanship, systems and equipment must be clearly defined and accepted by all concerned if adequate guarantees of performance are to be placed in force.

• The design and construction team must have a definitive point in time where their contractual obligations have been fulfilled and they can consider their legal relations closed out so far as project design and construction administration and operations are concerned.

• The owner must have a specific point in time where he can consider the project legally his without any hang over potential encumbrances from the design or construction team.

• The design and construction team must be able to use the project as a facility which they have no hesitation in describing or showing to prospects and current clients.

• A well closed project is insurance of future good relations with specialty contractors on the job as subcontractors of the prime contractors.

• The properly closed project makes no unreasonable or unpredictable demands on the design and construction staff subsequent to the close out.

The close out process does not start as the construction phase is being completed but long before. Closing out is an ongoing action. Throughout all phases of the job the experienced construction team studies the documents and the work so as to set how each element can best be turned over to the owner in accordance with the contract.

Some of the many steps to be taken to properly close out a project are given below. The list is for all parties to the contract, since most are involved in the close out phase. Parties indicated in ( ) are those most concerned with the item. Where multiple parties are indicated it does not necessarily indicate the parties must participate together in the action.

The list is at random. (Note: This list will be arranged by categories as items are added)

1. Prepare a construction record package. This set of documents was formerly called the as built drawing set. (contractor)

2. Obtain, where appropriate, a certificate of occupancy, or equivalent document, from the local building department, or other regulatory and enforcement agency. (owner, architect/engineer, contractor)

3. Prepare, distribute and have approved by the owner, the architect/engineer and the contractors, a punch out procedure. (contractor, architect/engineer, owner)

4. Punch out the project and complete the punch list requirements within an agreed upon time frame. (architect/engineer, contractor, owner)

5. Prepare, submit and accept the operating and maintenance manuals for the total project. (contractor, owner)

6. Clear final payments on the project and obtain proper waivers of lien. (contractor, owner)

7. Provide the owner with a proper set of construction documents for reference use. (contractor, owner)

8. Collect and store job logs, diaries, daily reports, test reports and all other documentation generated by the job activities. (contractor, owner, architect/engineer)

9 . Bring all meeting minutes and record files up to date so as to permit easy use and retrieval of needed information. (contractor, owner, architect/engineer)

10. Collect and bind all official and unofficial project photos. (contractor, owner, architect/engineer)

11. Collect and record all project network plans, schedules and bar charts by issue number, subject and date. (contractor, owner)

12. Close out and store all correspondence and other record files. (contractor, owner, architect/engineer)

13. Assemble and properly store all shop drawings and other job related submittals. (contractor, owner, architect/engineer)

14. Request the architect/engineer of record to make an inspection resulting in the granting of a certificate of substantial completion. This may be required to to obtain a certificate of occupancy. (contractor, owner)

15. Plan and implement grand opening or preview festivities for major team members, company principals and others contributing to the planning, design and construction of the facility. (owner, contractor)

16. Each party should conduct their own job critique during which responsible parties to the project meet and identify points of strength and weaknesses in carrying out the job. One major product of this critique should be a set of recommendations for improvement of future performance, and documentation of the problems encountered and how they were resolved. (contractor, owner,

architect/engineer)

17. Relinquish, or account for, all client owned tools, spare parts, and extra stocks of materials, rightfully the property of the owner. (contractor, owner)

18. Provide the owner copies of all releases, including final inspection certificates, occupancy permits, operating certificates, health department approvals and permits, and all other similar documents to allow the owner to occupy the building under full understanding of the conditions of the turnover. (contractor, owner, architect/engineer)

19. Label all electrical panel boxes, plumbing lines, valves and equipment as required for proper operation and maintenance. (contractor)

20. Provide all keys and keying schedules. (contractor, owner)

21. Submit a final statement of accounting, as required, to the owner and the architect/engineer. (owner, contractor, architect/engineer)

22. Obtain, prepare or issue a final change order reflecting adjustments to the contract sums not previously made by change orders. (contractor, architect/engineer, owner)

23. Send sincere thank you letters as appropriate to the owner, to the design team and to various contractors involved on the job. (contractor, architect/engineer)

24. Provide the owner a complete list of contractors and vendors participating in the job and indicating their installation responsibilities. (contractor)

25. Insure the owner is placed on the marketing call list, mailing list and other action tickler files as appropriate. (contractor, architect/engineer)

26. Arrange for such open house activities as may be desired or required (owner, contractor, architect/engineer)

27. Insure that your company identification is shown somewhere in the building if permitted. (owner, a/e and contractor)

28. Insure the project is as clean or better than called for in the specifications when your staff moves off the job. Don't lose the good will of the owner by leaving him a dirty job. (contractor)

29. Properly train and turn over the facility to the owner's representatives. Depending on the size and complexity of the project, the training process should begin from one to three months before occupancy. (owner, contractor)

30. Establish and approve the start of all warranty and guarantee periods for all material and equipment on the job prior to owner making the facility operative.

(owner, contractor, architect/engineer)

31. Prepare and submit to the owner a Construction Record Package. This package should contain the following: (contractor)

a. The construction record set referred to above.
b. Specific warranties required by the specifications
c. Workmanship or maintenance bonds required
d. Maintenance agreements called for by the specifications
e. Damage and settlement surveys of the site and the facilities
f. Final property surveys of the site.

32. Submit a final billing to the owner containing a list of all incomplete items and a properly assigned cost to each item. (contractor)

33. Advise the owner of any insurance changes over existing or past requirements or dates. (contractor, architect/engineer)

34. Complete all pre start up testing, run in and instruction along with submission of operating and maintenance manuals. (contractor, owner)

Note: All pre start up and start up requirements should be fully described in the contract documents and clearly referenced to the warranty period.

35. Submit final meter readings for utilities, and measured records of stored fuel at the time of substantial completion. (contractor)

36. Submit to owner, the consent of surety to final payment if required. (contractor)

37. Have final inspection made by an experienced exterminator to rid the job of rodents, insects or other pests. (contractor, owner)

38. Read the full contract document requirements (drawings, specifications, and contract) for closing out the job. (contractor, owner, architect/engineer)

39. Provide the owner a certification as to the building area calculations including gross square footage leasable square footage, and area use assignments.

Ralph J. Stephenson, P.E.
Consulting Engineer

April 12, 2000

Dear Construction University Faculty:

A few years ago I was asked by a structural steel fabricator in Grand Rapids, Michigan to summarize some informal remarks I had made about why the planning, design and construction profession is so significant.

At first I thought it would be a difficult request to fill. How wrong I was! The summary was easy to write and it stimulated some ideas that had been rattling around in my mind for a long time. The essay is no intellectual masterpiece and was written from memory about the off-the-cuff remarks I had made at the evening program on which I had appeared.

In reading the essay the other day it seemed to me that the content of the paper might be of value to today's construction professional. Perhaps you will agree.

Comments and essays about our business and profession are always welcome. Please write and send them along.

Regards,

Ralph

Five Ingredients of Significance

by Ralph J. Stephenson, P.E.

-- 1074 words
-- approximate reading time - 5 minutes

Five ingredients are critical to good thinking and effective management in design and construction.

- Importance!
- Responsibility!
- Excitement!
- Contribution!
- Methodology!

Properly proportioned, blended, and applied, they bring important rewards to skilled practitioners who plan, design, construct, and operate our society's buildings and facilities.

Ralph J. Stephenson, P.E.
Consulting Engineer

These rewards enrich professional life, and are won as we become aware of how the five act in our daily work.

First, let's examine - *Importance*.

1. Importance!

The design and construction professional contributes greatly to the quality of our total environment. This contribution of knowledge, skill, ingenuity, ethical behavior, and sound moral outlook makes the generic construction practitioner a front line battler for good. It identifies the professional as being an important individual. It makes the organization within which he or she works a significant vehicle for societal good.

We in the construction industry must think of our efforts as contributing to society's benefit without our worrying overmuch about who gets the credit or recognition for what is accomplished. Doing this makes you important to others.

The second point of consideration is - *Responsibility*.

2. Responsibility!

Responsibility for our actions as professionals is an integral part of our duties. We cannot always be 100% right. We can however, improve the probability of being accurate and correct to a degree where the public, our employers, our clients, and our peers may safely place high confidence in our judgment.

This confidence should generate a shared understanding that we will take responsibility for our actions and their results.

In the work place, some may have a flawed perception of what constitutes a mistake by the skilled professional. This is a risk all professionals, credentialed or not, must take. We cannot transfer that risk to others who are not so fortunate or knowledgeable, nor as able to carry the burden of such risk.

Your decisions as to how to carry responsibility are part of your professional thinking. They are developed by your upbringing, your work, your training, your education, and your experiences. The true professional must accept the risk of responsible action by being honestly responsible.

Feeling responsible for a job is often as great a reward as is feeling you have contributed to that job's success

Taking the risk of being responsible generates the next reward element of our business life - *Excitement*.

Ralph J. Stephenson, P.E.
Consulting Engineer

3. Excitement!

To chase truth in things technical is a natural instinct of the true generic construction professional. Excitement is one of the most sought after rewards of good construction - a business where the product is of critical importance, and its design and manufacture is in your hands.

Excitement is the process of experiencing the ups and downs that accompany any contribution to society's well being. It is the barometer that measures the pressure, or lack of, to do well.

The reward of excitement is frequently found in both the action and the result. When we are about to accomplish something significant, excitement mounts. When we have accomplished something significant, excitement is heightened by what the accomplishment means to those for whom we took the action.

Excitement must be one of the driving forces for a professional who desires excellence. However, the project must be worthy of that excitement and the participants must be willing to join in. This leads to our next significant ingredient - *Contribution*.

4. Contribution!

If you don't care who gets the credit you can accomplish anything.

Believing this brings into view a vast array of rewards and benefits to the professional practitioner. Credit is a tool to encourage improvement and learning. If you are a real pro at what you do, and you want the results of your work to bring about truly constructive change, then by contributing and transferring credit you can often gain rewards far beyond a direct credit benefit to yourself!

When you contribute what you can without concern for being given credit, you gain benefits that encourage you and those being given the credit, to become even better.

Interestingly, a direct gain for another by your efforts, usually results in a gain for you, often from unidentifiable sources. Many times this unexpected bonus comes from those who have been credited and their supporters.

Even if the rewards of giving don't result in a credit to you, don't worry - your store of gifts for others won't ever run out. Giving encourages giving.

The rewards of accomplishing important things, accepting responsibility, experiencing excitement, and making a contribution of talents without expectation of credit, bring into view a fifth ingredient of significance - *Methodology*.

Ralph J. Stephenson, P.E.
Consulting Engineer

5. Methodology!

Often the secret of doing something well is first doing it poorly -- knowing some degree of failure. We must all experience failure to understand what success means. Patterns of success seen through the traps of failure help us develop better methods of doing things.

These are then merged into habits and processes that encourage the elements of successful action to be continually duplicated and evaluated, and when necessary, changed or discarded.

Every exceptional professional has built a variety of procedures that serve well and hold failure at bay. The reward of using these procedures is the gift of success.

When you have learned to use good procedures well, when not to use them, and when to adapt them to a different situation, you will have built a dependable professional methodology.

Successful practitioners must use good methods to guide them in matters of significance.

(The basis of a talk to the Grand Rapids, Michigan
chapter of the American Society of Professional Estimators)

Ralph J. Stephenson P.E., P.C.
Consulting Engineer

To the faculty of the Construction University:

Many times the design and construction professional encounters a decision making dilemma in which ratings, rankings, and listings must be applied to a set of factors, weights, and attributes to determine what the best combination of all of these is for a specific situation requiring a decision, a prediction or an evaluation to be made.

The various theories of probability can be of help in resolving many of the problem situations encountered in our business of generic construction. However we may not always have the technical knowledge to work comfortably with formal statistical or probability methods. Therefore I offer the following essay, the eighth in the series of Construction University papers to help the practitioner make good, and justifiable, decisions. In CU #008 I will introduce a relatively simple method of ranking choices when several factors may influence the decision as to which are the best.

I call the system weights and values as a decision making tool.

Please let me know of your own experiences with decision making tool and with your permission we will pass them along to others in the construction industry.

Ralph J. Stephenson, P.E.

Construction University

Weights and values as a decision making tool

April 24, 2000

--712 words
--reading time approx. 5 minutes

In a decision making process the selection is often best made by a multidimensional process based on situational characteristics and factors that are nominally variable.

The purpose of decision making for the responsible project manager is to insure that an objective recommendation is provided to his or her upper management staff. Upper management is then responsible for adjusting the objective decisions of the project manager to a decision in line with what the upper management staff feel personally, politically, professionally, subjectively, and technically is the appropriate selection.

Ralph J. Stephenson P.E., P.C.
Consulting Engineer

The area addressed in this essay is the application of an orderly procedure to objective decision making. The technique is called the weight-value or WV process.

The WV process is implemented by taking well defined steps necessary to reach project level decisions. These steps are:

1. Select, write down, and verify the various decisions possible. What courses of action are available?

2. Select the major factors of importance in making an objective selection of a best course of action. What are the items that are important to making a proper decision? I recommend there be no more than ten of these. If you have selected more than ten try to combine factors having similar evaluation characteristics.

3. Assign a weight to each factor that describes numerically, to those to whom the recommendation will be made, how important the project manager and his team think this factor is in selection of a course of action. Factors should be given a weight of one to ten. One means the factor is of minimum importance in the evaluation. Ten indicates the factor is crucial to the evaluation. A definition of the gradation steps is often of assistance in improving the sensitivity of the process.

It is essential to realize that the factors selected and screened for use must all be of relative importance and that the assignment of weights should spread from one to ten. A help in doing this properly is to determine the most important and critical of the factors and assign it a value of eight to ten. Next select the least important factor and give it a weight of from three to one. The remainder should fall somewhere in between. Remember more than one of the factors being weighed can receive the same number. You are not ranking the factors, you are weighing them.

4. Assign a value to each potential course of action or each decision possible for each of the factors selected and weighed. If there are three courses of action possible, and you have selected five factors by which these are to be judged, you will have to assign 3 x 5 = 15 values to the entire array. This can be seen in the following matrix example where alternative project delivery systems for constructing a warehouse are being considered.

The three delivery systems under consideration are 1.) an award of a hard money contract from a full set of contract documents; 2.) retention of a non liable construction manager to run the project; or 3.) the use of a liable general contractor involved early as a construction consultant and providing iterative estimating leading to submission and acceptance of a guaranteed maximum price.

Ralph J. Stephenson P.E., P.C.
Consulting Engineer

Project delivery systems being considered & their value in satisfying the demands of each factor of importance - warehouse project

Factors	Wts.	Values		
		Hd money	Non liable cm	Prog pricing to gmp
1.Capital cost	08 x	08 = 064	04 = 032	06 = 048
2.Function	10 x	09 = 090	06 = 060	10 = 100
3.Appearance	02 x	06 = 012	04 = 008	07 = 014
4.Life cycle cost	04 x	06 = 024	03 = 012	08 = 032
5.In house stff needs	08 x	04 = 032	03 = 024	07 = 056
Totals		**222**	**136**	**250**

The selection analysis above indicates the best delivery method of the three being considered is a progressive pricing system leading to submission of a guaranteed maximum price for which the contractor will construct the project.

It should be emphasized that the validity of factor selection, the factor weighing, the selection of alternatives and their valuing depend totally on the exercise of sound judgments by those making the analysis. Usually for each decision to be made such an analysis as above is made by several qualified staff. Some may not even be associated with the project directly but only acquainted with the key demands of the project program and mission. This wider range of views and ideas often lends strength to the recommendations.

Comments, observations, ideas?

Ralph

Ralph J. Stephenson, P.E.
Consulting Engineer

May 15, 2000

Dear Construction Faculty:

CU #009 below is one of the more complex views of the project and program management systems that we have included in the CU series. The process described below is designed to help both new and experienced managers get a firm handle on what it is that he or she is expected to manage. The process likewise can help show those on the project or program team what role they are to play in achieving the vision and mission of the entire action effort.

As usual, comments, rebuttals and new ideas are welcome, along with your permission to include them in future Construction University essays. Let us hear from you!

We will soon be collecting comments received so far and will incorporate them into a future CU.

Keep in touch!

Regards,

Ralph J. Stephenson

VISIONS, MISSIONS, GOALS, OBJECTIVES & MANAGEMENT - CU 009

By Ralph J. Stephenson, P.E.

-- 1271 words
-- Approximate reading time - 10 minutes

Since the start of the American Industrial Revolution in the late 1700s and continuing through the 19th, 20th and into the 21st centuries, entrepreneurs have wrestled with defining what they do, what they would like their future to be, and how they could reach a desired goal through effective management of their organizations.

You, who practice management for a livelihood, have probably wondered if there is

a pattern for success in the application of philosophies that have seemingly driven business planning over the past 200 or more years.

I believe "yes" is the answer!

While recently reviewing various concepts of words and their meanings I came to a somewhat fuzzy, inconclusive conclusion that there are five words that have permanent significance in defining how a business or enterprise becomes and stays successful. The five might be incorporated into a single sentence entitled "How to be Successful." -- but more about that shortly.

We live in two worlds, the world-of-words and the world of non-words. The world-of-words is that in which we live by simulating actions through words and other symbols that describe events that could or actually do happen. Let me give you an example.

When I am preparing a plan and schedule of a construction project I am working in a world-of-words. The plan is made up of words and symbols that describe actions, of arrows and boxes that represent the relation of an action to other actions, and of a defined duration of the action that is used to calculate the time line characteristics of the project model.

The world of non-words is that in which we live and cause things to happen by our actual presence and physical actions. A world-of-words model such as described above is only a guide to the physical construction of the project. We build the actual project in the world of non-words.

By this brief essay I shall attempt to show how the manager can start building a sound action plan in a world-of-words using key descriptive elements that are critical to the plan. Then we can relate this plan model to the world of non-words showing how the manager can simulate various alternatives while translating his or her model into a real set of actions.

Suppose we want to design and build a new library and remodel an adjoining existing library. The process of planning to build can be described in seven steps:

1. First determine what our grand plan of action will require. We will need --

• **A Vision** - The application of competence in discernment or perception; intelligent foresight: the manner in which one sees or conceives of something.

• **A Mission** - A statement of the most important result to be achieved by our project or program successfully matching our vision.

• **Goals** - The unquantified desires of an organization or individual expressed without time or other resources assigned.

• **Objectives** - Quantified targets derived from established goals. Commonly used resources in converting goals to objectives are money, time, human abilities, actions, equipment, and space.

• **Management** - The act and manner of defining, assembling and directing the application of resources to achieve our mission and specific goals and objectives.

2. Next we arrange the essential components in a rough array or model showing a possible sequence in which they might occur in relation to each other.

VISION MISSION GOALS OBJECTIVES MANAGEMENT

Now we subtract the components one by one from our model and evaluate what happens when that component is removed.

3. Action - subtract the VISION.

MISSION GOALS OBJECTIVES MANAGEMENT

- Result - CONFUSION ABOUT WHERE WE ARE HEADING.

By removing vision from the model we blur the meaning of the project or program, and raise serious questions about why we ever embarked on this course of action anyway: the removal produces action paralysis and confusion about desired results.

4. Action - Put back the VISION and subtract the MISSION.

VISION GOALS OBJECTIVES MANAGEMENT

- Result - LOSS OF MANAGEMENT DIRECTION.

We have now removed a vital link between the foresight to visualize and the

definition of specific goals needed to achieve managerial success. Mission definition is required to keep us from losing the path to our vision.

5. Action - Put back the MISSION and subtract the GOALS.

VISION MISSION OBJECTIVES MANAGEMENT

- Result - POOR TIMING IN OUR DECISION MAKING.

Now, we have either extended or reduced the time from stating our mission to defining our objectives to a degree where we may lose the action time sense needed to proceed in a realistic manner.

6. Action - Put back the GOALS and subtract the OBJECTIVES.

VISION MISSION GOALS MANAGEMENT

- Result - DRIFTING MANAGEMENT.

We end up having to manage elements of the model without having clearly defined time frames.

7. Put back the OBJECTIVES and subtract the MANAGEMENT.

VISION MISSION GOALS OBJECTIVES

- Result - INABILITY TO ACHIEVE OUR OBJECTIVES, GOALS AND MISSION.

We now have no engine or rudder left on our ship by which we can achieve our vision through the use of the model objectives, goals, and mission.

* * *

The above model and the brief analysis-by-subtraction shows how critical the major components of our model are: how they help us to reach our vision while fulfilling our mission. We can summarize this essay in a single sentence entitled "How to be Successful"

"You improve your chances of success in any endeavor by applying a vision (what you see in your future), understanding your mission (the primary achievements

you must reach), setting your goals (targets, not yet quantified, but at which you are aiming), incorporating your goals into a set of objectives (quantified targets), all designed so you can provide a solid business plan, molded by whatever management form you feel best fits your abilities."

* * *

CU #009 glossary of terms

• **Business** - One's occupation, profession or trade.

• **Business model** - A graphic depiction of the elements which make up a business entity. The model usually identifies premises, objectives, and implementation. It recognizes basic business functions, business activities and manager activities.

• **Efficient** - Doing things right

• **Effective** - Doing the right things.

• **Enterprise** - A project that is of above average importance and requires boldness , readiness and risk-taking in its doing.

• **Entrepreneur** - An employer of productive labor. A person who organizes, operates, and assumes the risk for a business venture.

• **Goals** - The unquantified desires of an organization or individual expressed without time or other resources assigned. (See objectives for related definitions.)

• **Management** - The act and manner of defining, assembling and directing the application of resources to achieve specific goals and objectives.

• **Mission** - A statement of the most important result to be achieved by a project or a program being successfully completed.

• **Objective** - Quantified targets derived from established goals (see goal). Commonly used resources in converting goals to objectives are money, time, human abilities, human actions, equipment, and space.

• **Profit** - The return in resources obtained by investing other resources in a business or an enterprise. Usually the returned resource has a greater value to the investor

than does the invested resource.

• **Subtractive analysis** - A means of reaching conclusions by subtracting various components of a model, and then evaluating what effect the subtraction has on the model.

• **Successful** - The favorable or profitable termination of attempts or endeavors: having obtained something desired or intended.

• **Vision** - The application of competence in discernment or perception; intelligent foresight. The manner in which one sees or conceives of something.

• **World-of-words** - The world in which we live by simulating actions through words and other symbols describing events that do or could happen in the world of non-words.

• **World of non-words** - The world in which we live and cause things to happen by our actual presence and physical actions.

"Be efficient about being effective."

Ralph J. Stephenson P.E., P.C.
Consulting Engineer
June 11, 2000

To: The Construction University Management Faculty:
From: Ralph J. Stephenson

When you work with other organizations, their management and their staff, you can gain much business-useful knowledge by observing critical elements of that organization's operations. Those that may contribute to the success, or lack of success, in people, management, and marketing relations include:

- How the organization functions,
- How successful the organization is as measured by your standards,
- What techniques the various departments and divisions use to maintain their organizational and management effectiveness,
- What they do, or don't do, that lowers or improves their potential for succeeding,
- What styles of management work or don't work as used by their various operations and staff management,
- ..... and on and on.

From several years of amateur and professional experience I can recommend a few characteristics that may reveal some of the most telling elements of similarities between your beliefs and the organizational characteristics that you might observe. These characteristics may accurately indicate if you and the place you are observing or benchmarking are headed in similar directions and have congruent visions, goals, objectives and operating modes that fit well with each other.

One of the most important of these elements is the nature of the organization as defined by the words "**conservative**" and "**forerunner**" (not to be intermingled with the meanings of politically oriented conservative and liberal). The following **benchmarking** essay may help you discover how the match between you and a work place plays a vital role in your future, particularly in the planning, design and construction profession.

* * * * *

Notes on Forerunner & Conservatively Managed Organizations

By Ralph J. Stephenson, P.E.

Total length - 1,169 words
Approximate reading time - 6 minutes

What are alternative names to **forerunner** and **conservatively** managed organizations? Proactive & reactive, positive & negative, front & back, do & wait, high risk & low risk, maximum & minimum, go & no-go, try & no-try, run & walk, hard money & negotiated, ...?

(For definitions of words in bold, underlined type see the glossary of terms at the end of this essay).

Let us start by testing a few of the characteristics that influence what kind of organization these words seem to describe.

• The **forerunner** organization tries to optimize the probability of being right.

• The **conservatively** organization tries to minimize the probability of being wrong.

• It is critical to understand that both types of organizations can be, and often are successful or unsuccessful. The style of forerunner or conservative is merely an indication of the way the organization achieves its successes or goes through the twinges of its failure.

• Some characteristics of the **forerunner** organization:

- Aggressive in their field of work,
- Young in mind and spirit,
- High risk takers,
- Are good at **leveraging** resources,
- Have good morale,
- Work well within the general absence of a dominant management structure,
- Healthy cooperation among lower management,
- Strong competitive drive at all levels of management,
- Strong sensing of (not necessarily knowing about) total purpose in respect to:
  Financial return on investment (see also **value-added**),
  Social obligation,
  Professional integrity,
  Technical excellence,
  Ethical behavior,
- Provision of **project sense of worth**,
- Sensing of true **value-added** to projects,
- Provision of sense of exciting **flux** to staff,
- Maintenance of an exciting environment,
- Constant forging ahead in their business arena,
- Desire & ability to adapt to **positive change**,
- Desire & ability to institute change,
- Desire & ability to accommodate change,
- Medium to low levels of incompetence tolerance,
- Strong leaning toward high individual performance levels,
- Low level of interest in business planning,
- Learn well from mistakes they make.

• Some characteristics of the **conservative** organization:

- Usually very well managed from top down,
- Moderately well managed from bottom up,
- Tend toward **paternalistic management,**
- Major decision making centered in top management,
- Good financial strength, if the organization is mature,
- Dependable,
- Predictable,
- **Secretive** at upper management levels,
- Closely controlled employee training,
- Modest salary structure,
- Standard and well protected employee **financial benefits,**
- Usually stress **hygiene** as opposed to **motivation,**
- High levels of employee **loyalty** in those who like the system,
- High **employee security,**
- Heavy use of pretested decisions at executive management levels,
- Long **tenure** of service among senior management,
- Intolerant of actions that pose threats to a **conservative** management style.

Case study for your consideration:

To illustrate the determination of **congruence** in management and behavioral characteristics let us look at Adam Jay, a 25 year old, well-educated civil engineer and project manager. Adam is registered as a professional engineer in several states and has good credentials in his professional field of construction operations. He is already being considered for a junior officer position in his company.

He has a strong drive to take good care of his family and to insure that they benefit from his short and long term professional efforts.

Adam likes the internal and external competitive aspects of general contracting. He couples this drive to a strong sense of the importance of caring for the public health, welfare and safety of his community.

The organizational structure of his employer's firm, Johnston and Sons, P.C. is rather rigid and in Adam's opinion a tad too highly regimented. However he appreciates the need for a relatively predictable structure to allow for a feeling of comfort and security that will allow planning properly for the future of both the company and the employees.

The need to express individually selected courses of action and decision making is strong in Adam's makeup, and he often feels he needs more excitement in his career work.

You are a trusted friend of Adams and considered by him as a coach and mentor. He has just asked you in a social setting what kind of organizations

he should plan to be with during the various stages of his career. He has phrased the query as an open question, and is obviously interested in what you have to say. You judge that he will listen, but might be inclined to tailor his opinions and decision to fit what words he wants you to use.

What career paths would you recommend Adam Jay follow over the next 10 years?

Glossary for CU #010 - Notes on Forerunner & Conservatively Managed Companies

• Benchmarking - The continuous process of measuring the products, services, and practices you employ against your toughest competitors, and against those companies and organizations recognized as industry and practice leaders.

• Congruence - Correspondence, agreement, harmony, or conformity.

• Conservative - Favoring moderate traditional views and values; restrained in style.

• Employee security - That benefit gained by one who works for another and enjoys freedom from risk, danger, doubt, anxiety, or fear.

• Financial benefits - The benefits obtained by practicing the science of effectively managing money and other assets.

• Flux - Constant or frequent fluctuation or change.

• Forerunner - One who, or that which, precedes as in time or ideas or abilities; one that runs in front of.

• Hygiene - The elements in an organizational situation that are acceptable to an individual but do not necessarily motivate him. These same elements, if unacceptable to the individual, may act as negative influences.

• Leveraging - The effective use of vested and earned authority and resources to solve problems and achieve goals and objectives.

• Liberal - Generally favoring proposals for reform, open to new ideas for progress, and tolerant of the ideas and behavior of others; broad-minded.

• Loyalty - Faithfulness to a person, ideal, organization, or custom.

• Motivation - The elements of a given situation that encourage, and make effective, successful and meaningful, the activities of those engaged in the situation.

• Positive change - Change that is managed so its control and use raises the potential for individuals or organizations to succeed at being excellent.

• Paternalistic management - A policy or practice of treating or governing people in a fatherly manner, especially by providing for their needs without giving them responsibility.

• Politically conservative - Of, pertaining to, or dealing with the structure or affairs of government in the private, public or volunteer sectors of our society and favoring moderate traditional views and values; restrained in style.

• Politically liberal - Of, pertaining to, or dealing with the structure or affairs of government in the private, public or volunteer sectors of our society, and not limited to or by traditional, orthodox, or authoritarian attitudes or dogmas. Generally favoring proposals for reform, open to new ideas for progress, and tolerant of the ideas and behavior of others; broad-minded.

• Project sense-of-worth - In project management, the quality that renders something desirable, useful, or valuable.

• Secretive - Not given to openness, as of purpose or action.

• Tenure - Permanence of position, often granted an employee after a specified number of years.

• Value-added - The return in resources obtained by investing other resources in a business or an enterprise. Usually the returned resource has a greater value to the investor than does the invested resource.

* * * * *

Ralph J. Stephenson, P.E.

Subject : CU #011 - Close out list for Community Medical Center Tenant Improvements
June 30, 2000

To: The Construction University Faculty:
From: Ralph J. Stephenson, P.E.

In response to CU #006 "Closing Out A Construction Project", Mr. Mike Breunig at Collins Project Management -- <mbreunig@collinspm.com> -- in Norcross, Georgia, sent the Construction University a close out list tailored to the construction of tenant improvements for a Community Medical Center tenant space. We have only a few specialized close out lists such as this and I asked Mr. Mike Breunig if we could send it along to the members of the CU faculty. His answer was a quick, short note

"Feel free to use the close out check list for any training programs for CU e-mails. Please give credit to:

Collins Project Management
5996 Peachtree Parkway
Norcross, Georgia 30092
Phone: 770-263-3733"

-- so, his check list constitutes CU #011, this addition to our ongoing close out essays.

Please let me know if you are still receiving the CU series of essays and please feel free to submit any material you would like to see in print to me for potential inclusion in future CU's.
Keep in touch!

Regards

Ralph

Ralph J. Stephenson, P.E.
Consulting Engineer
June 30, 2000

Community Medical Center Tenant Improvements - Close out check list

Courtesy of

Collins Project Management
5996 Peachtree Parkway
Norcross, Georgia 30092
Phone: 770-263-3733

--834 words
--approximate reading time - 5 minutes

A. RULES OF THE SITE

1. Final cleaning operations
2. Check all work area light fixtures
3. Respond to all Field Inspections and Punchlists - Tenant MEP Engineers
4. Certified Air Balance Report
5. O&M Manuals for all MEP Equipment
6. "As-built" MEP Drawings
7. Final Lien Waivers 01010-22.
8. Certificate stating that no hazardous materials have been utilized in the construction.
9. Certificate of Occupancy
10. All keys to building Standard locksets and custom locksets

B. SUBSTANTIAL COMPLETION PROCEDURES

1. Delivery of maintenance materials and tools
2. Removal of temporary facilities
3. Changeover to permanent locking systems
4. Final cleaning

5. Owner informed of necessary procedures for changing over insurance coverages
6. Owner informed of procedures for changing over operation, maintenance, security, etc.
7. Owner received occupancy and operating permits from authorities having jurisdiction.
8. List of incomplete work
9. Startup reports
10. Final testing, adjusting, and balancing reports
11. Demonstration of equipment and systems to the Architect and Owner and demonstration reports
12. Instruction of owner's personnel and instruction reports
13. Contractor's Warranties
14. Subcontractor's Warranties
15. Operation and maintenance data
16. Keying Records
17. Certificate of Substantial Completion

C. APPLICATION FOR PAYMENT FOLLOWING SUBSTANTIAL COMPLETION
1. Final Change Order
2. Contractor's affidavit of release of liens
3. Release of Liens - Subcontractors
4. Request for reduction or release of retainage
5. Consent of surety to reduction in or partial release of retainage
6. Final list of incomplete work

D. FINAL COMPLETION PROCEDURES
1. Completion of all work
2. Maintenance agreements
3. Project record documents
4. Request for final inspection from contractor to architect with previous inspection lists attached
5. Final completion inspection by Architect (punchlist)
6. State Health Planning Agency (SHPA) approval of work and consent to occupancy
7. Completion of all items on punchlist or inspection reports
8. Updated final statement, accounting for final changes to the contract sum
9. Consent of surety to final payment
10. Certification that financial obligations to governing authorities and public

utilities have been fulfill
11. Description of unsettled claims
12. Certificates of insurance for all coverages specified to commence at final completion

E. CONSTRUCTION CHANGE DIRECTIVES
1. Account for unused materials that have been paid for by the owner

F. TEMPORARY FACILITIES AND SERVICES
1. Permanent Facilities Used during Construction: Clean; replace parts that are worn in excess of that expected during normal usage
2. Restore all areas of the existing facility damaged by construction activities to their existing condition

G. PROJECT RECORD DOCUMENTS
1. Record Drawings
2. Project Manual (Specifications)
3. Record Submittals with Shop Drawings, Product Data and Samples
4. Operation & Maintenance Data
5. Warranties
6. Schedule of Products
7. Controls Diagrams
8. Firestopping and Smokestopping final inspection reports
9. Project Record Drawings showing location of all fire and smoke barriers, sealing of penetrations, references to maintenance data
10. Joint Sealers - 1 year warranty
11. Solid core plastic laminate-faced interior doors - warranty for life of original installation
12. Lead lined wood doors - x-ray protection test
13. Specialized tools as needed for adjustment, maintenance, removal and replacement of builders hardware
14. Keys - furnish 2 change keys for each lock
15. Lead lined gypsum board - x-ray protection testing at joints and penetrations
16. Glazed Pavers & Wall Tile - furnish at least 5 percent of total product installed maintenance stock
17. Acoustical ceiling lay-in panels - furnish at least 5 percent of total product installed maintenance stock
18. Exposed ceiling suspension members - furnish at least 2 percent of total product installed for maintenance stock

19. Resilient tile flooring - furnish at least 10 percent of each variety installed for maintenance stock
20. Resilient base - furnish at least 10 percent of each variety installed for maintenance stock
21. Resilient sheet flooring - furnish at least 10 percent of each variety installed, in full roll width, for maintenance stock
22. Paint Maintenance Stock - furnish not less than one labeled and sealed 1-gallon can of each type of finish coat and color
23. Wall Coverings Maintenance Stock - Vinyl - 2 percent of the number of rolls installed
24. Wall Coverings Maintenance Stock - Wallpaper - 2 percent of the number of rolls installed
25. Plastic Laminate Lockers - turn keys over to the owner
26. Accordion Folding Partitions - 2 year warranty
27. Accordion Folding Partitions - maintenance materials
28. Accordion Folding Partitions - demonstrate operation procedures
29. Medical Equipment - demonstrations, warranty cards and instruction booklets
30. Medical Equipment - check for operating condition
31. Mechanical Equipment - Record (As-Built) Drawings
32. Mechanical Equipment - Operating and Maintenance Manuals and instruction
33. Mechanical Equipment - Test and balance and report
34. Mechanical Equipment - Minimum 1 year warranty required on all division 15 work and equipment
35. Plumbing Systems - disinfection certification
36. Sprinkler Heads - provide a minimum of 2 spare heads of each type
37. Packaged Air-Cooled Chillers - startup report
38. Automatic Controls and Energy Management System - startup report
39. Automatic Controls and Energy Management System - installation, operation, maintenance service manuals and parts brochures
40. Automatic Controls and Energy Management System - graphics
41. Electrical As-Built Drawings
42. Electrical Equipment - maintenance and instruction manuals
43. Electrical - tests, demonstration and instructions
44. Electrical system warranty
45. Electrical - spare fuses and storage cabinet
46. Electrical Service and Distribution - typewritten directory for all panelboards
47. Nurse/Patient Communications Network - one year warranty including

guaranteed emergency and routine service response times
48. Nurse/Patient Communications Network - provide spare parts and maintenance contract
49. Nurse/Patient Communications Network - train all staff receiving the new equipment
50. Nurse/Patient Communications Network - as built drawings of all network components and associated wiring
51. Motor Controls and Wiring - test all overload relay control circuits

Ralph J. Stephenson, P.E.
Consulting Engineer

July 21, 2000

What is Happening to the Use of Technology in Construction Operations?

By Ralph J. Stephenson, P.E.

-- 1530 words - reading time approximately 10 minutes

Some construction professionals sense that their use of conventional operating techniques is out of synch with much of the new construction technology now being produced and marketed by electronic equipment and software suppliers.

At the beginning of the design and construction electronics age in the mid 1950's contractors' technical needs were filled at a pace that allowed even the most cautious professionals to see the resulting benefits and to gradually fold the systems into their daily operations. Examples of this early embracing of technology could be seen in the widespread use of estimating systems using computers and spreadsheets (1960), and critical path planning using early CAD systems and computational systems (1955).

Today, the pace of new entries into the electronic design and construction market make it almost impossible for any but a few users of these systems to keep up with new developments and new products. The result is often chaos in and among firms, and within the industry disciplines. New professional graduates are bringing academically learned, cutting-edge programs to the field where they are promptly put at odds, and often invidiously compared, with other operational systems...both old and new.

Let's face it: not every professional can know every program and every platform...nor does he or she want to!

There is an even more fundamental acceptance and learning problem. It deals with our assessment of just what it is that we seem to need to effectively and profitably design, engineer, and construct.

To help bring into focus what this means to the professional constructor let's first examine four factors that determine how well we will be doing business and constructing facilities during the current booming technological expansion.

These four include:

Factor #1. Operational needs of the successful contractor.

Factor #2. Basic technological systems that are used to meet these needs.

Factor #3. Problems resulting from failure to match the tools available to meet these needs.

Factor #4. Solving the problems caused by not meeting operational needs.

Once we have a clear understanding of these four factors, and how they affect our organization and our profession we can apply the results to planning how we can best use the evolving technology to achieve success. Let's first prepare a check list of the factors in a specific program of improvement...for instance gaining excellence in the preparation of useful project plans and schedules.

Factor #1 - Some of the operational needs of a successful construction contractor who want to plan and schedule well.

- Knowing how to manually prepare network plans & critical path diagrams.
- Understanding the difference between planning and scheduling.
- Properly using workable expediting systems.
- Knowing the yardsticks by which to measure project success.
- Understanding the concept of program management.
- Understanding and properly using project delivery systems.
- Knowing how to keeping accurate records.
- Preparing and using check lists of design and construction actions to be taken.
- Knowing how to, and, then, properly processing revisions.
- Implementing principles of good field inspection for the project team.
- Knowing how to manage a project or a program.

- Understanding how to evaluate various impacts on project progress.
- Knowing the common causes of contested claims.
- Being able to accurately identify the problem job.
- Understanding how to properly close out the project.

Factor #2 - Some of the basic technological devices currently being used by successful construction contractors.

- Office based computers and operating software.
  Lap tops,
  Desk-based PC's,
  Main frames,
  Computer-aided drafting and computational hardware and software,
- Hand-held computers and operating software.
- Hand-held cell phones.
- Communication systems to link job sites with home office and other project personnel.
  Written,
  Verbal,
  Pictorial and graphic,
  Computational,
- Hand-held TV devices.
- Internet and other similar information carriers that import and send data.

Factor #3 - Types of problems often resulting from failure to match the tools available to the needs to be satisfied.

- Poor job management.
- Inability to communicate with others.
- Poor staff morale and attitudes.
- Low personnel quality and people difficulties.
- Not being a good on-site neighbor.
- Inability to take timely action.
- Inability to properly plan and schedule the project or program work
- Failure to properly organize, exert authority, and take responsibility.
- Dirty, poorly planned, or dangerous work-site conditions.
- Slow and/or biased performance in revision processing.
- Poor construction document quality.
- Slow or incompetent submittal processing.

- Inadequate user group interaction needed to properly build the job.
- Inadequate or inaccurate documents and documentation.
- Slow, improper, and untimely decision making.
- Slow, inadequate, or improper procurement of materials and equipment.
- Sloppy, slow, and untimely closing out of the project.
- Slow or inaccurate payment processing. (Prompt payment is the life blood of a successful job.)
- Slow, delayed, or biased approval processes.
- Time growth which extends the project without corresponding relief.
- Inadequate staffing and manpower provided on job.
- Disproportionate cost growth of the project that damages expected cash flow.
- Late, excessive, or unfair substitutions and alternates.
- Failure to maintain regular project evaluations.
- Flawed constructibility usually caused by faulty programs and construction documents.
- Legal matters that interfere with job progress and create artificial problems.
- Extreme weather conditions that interrupt job continuity and increase costs.

Factor #4 - Learning systems good contractors can use to effectively meet operational needs.

- Mentoring
- Coaching
- Training
- Education
- Orientation
- Cooperation with training institutions
- Cooperation with educational institutions
- Tightening certification requirements

The assignment immediately in front of me as I write this article is to comment on the ways modern technology is affecting planning and scheduling and the ways we deliver successful construction projects today. With the above four factors fresh in our minds let us start the critique.

• • •

My comments may seem terse, but this is where I think we need to start --

Comment #1 - We are not following evaluation systems that provide rational and objective arguments for adopting, rejecting or revising the bewildering array of

systems we are asked to consider in our professional work today.

Comment #2 - We are wasting enormous amounts of time that could be best spent in becoming better builders on substitution of eye-catching graphics for understandable explanations of the new technological systems. ("If it's pretty it must be right, accurate and sufficient.")

Comment #3 - We are not being discerning enough in selecting technological systems that actually contribute to cost effective practices.

Comment #4 - In our rush for volume (too often at a sacrifice of quality and profit) we do not take adequate time to fully understand the actual operational techniques needed to build properly.

Many planners, designers, architects, engineers, contractors and facilities managers no longer spend enough time tracking jobs in the field. They don't know how long design and construction operations really take, how much they cost, whether or not they will work properly -- simply because they're not monitoring their projects, and they are not talking with, and watching, the skilled trades and managers who actually build the work on the site.

Comment #5 - We too often substitute electronic processing for mentally derived logic, analysis and decision making by those individuals actually responsible for doing and for managing the work.

Comment #6 - We are too complaisant, too accepting, too trusting that technological systems will automatically solve all our problems. We need to challenge doubtful assertions, and to ask again and again...does this technological system--really help us achieve our goals and objectives?

Comment #7 - We must better train and educate technical professionals in the definitions and use of words used to describe construction operations. When we all assume we know what a given word means...and then find out it means different things to different people... we're headed for problems. For instance I hear many professionals use the words "planning" and "scheduling" in the sense that they mean the same thing. Not true!

> Planning is to define project actions and their relations with each other in a sequence that will most effectively achieve goals and objectives.

Ralph J. Stephenson, P.E.
Consulting Engineer

Scheduling is to show by a graphic or written tabulation of project activities where the planned activities are to actually start and finish. The schedule is derived from the plan of action by locking the tasks and their resources into specific time positions.

Comment #8 - We don't see what it is that makes problems for others on the project team. We are frequently so concerned with ourselves and our jobs that we exclude any attempt to understand what's going on around us. The result is that we needlessly cause problems for others.

Comment #9 - We fail to understand the ramification of problems created from not knowing how electronic systems differ from human systems. This practice tends to shift the responsibility for designing and using the system from the user to the electrons... all you have to do is type it in and the machine does the rest!

Comment #10 - We often resist learning how to use new systems because they seem to pose a threat to our career by putting us at a disadvantage with the younger, more knowledgeable practitioners. Therefore we fight the new techniques, the new systems; we fail to be effective construction professionals... and, we fail to help others do what we actually believe is needed to improve our industry.

In sum, I would assess our situation this way: Technology is not bad -- we merely use it poorly. We can do better.

Comments?

Regards,

Ralph