PINCOCK Perspectives

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Construction Management – Establishing a Strategy for the Safe and Successful Completion of Your Construction Project

Introduction

A successful construction project is one which is completed **safely**, within the allotted time, under estimated construction budget, to within acceptable design criteria and without any claims against either the owner or contractor. It does not matter whether you are remodeling your home or building a multi million-dollar Greenfield project, a construction manager must ensure the project is defined to sufficient detail for a seamless transition starting from the concept stage through final acceptance of the project.

The following discussion will briefly define the standard stages of a project; (1) proposal, (2) design, (3) contract award, (4) actual construction and (5) closing the project. Emphasis will be given on the primary types of contract delivery methods and issues that every construction manager will address, regardless of the time of delivery method employed.

The construction manager (CM) may be the owner or his designated representative. It must be essential that a good construction manager not only be a coordinator who can build consensus among designers, owners and contractors, but also be firm in directing the safe and efficient completion of the project. The Construction Management Association of America has defined the CM as the "process of professional management applied to a construction program from concept to completion for the purpose of controlling time, cost, and quality". We would also add safety to the CM's list of priorities.

Concept (Proposal)

An owner should pose the following questions during the conceptual stage of your construction project.

- WHAT is the construction project?
- WHY is the project being proposed?
- WHERE is the project located?
- WHEN does the project need to be completed?
- WHO is responsible for each project task?
- HOW will the project be completed?

An owner will generate the concept of the facility under consideration with an estimate of the cost of the project, the time to complete, and the necessary resources to complete the project. The method of award will be defined. Any successful construction project is defined well in advance by or under the direction of the owner for any physical work, and the appropriate risk analysis has been performed. Your risk analysis should include, but not be limited to performing a market analysis, and feasibility studies, which should include cost benefit analyses, cash flow analyses, and sensitivity studies. An owner should define how the project will be managed.

CALENDAR

- ***PDAC 2006***
  March 5–8, 2006
  Metro Toronto Convention Centre, North Building
  Toronto, Canada
  e-mail: lmcdonald@pdac.ca
  Visit us at Booth 312

- ***2006 SME Annual Meeting & Exhibit***
  March 27–29, 2006
  America's Center
  St. Louis, Missouri
  e-mail: sme@smenet.org
  Visit us at Booth 413

- ***Asia Mining Congress 2006***
  March 27–31, 2006
  Grand Hyatt
  Singapore
  www.terrapinn.com/2006/asiamining

- ***MiningWorld Russia 2006***
  April 25–28, 2006
  Crocus Expo - International Exhibition Centre
  Moscow, Russia
  e-mail: miningexplo@primexplo.ru

- ***MinSands 2006***
  May 18–19, 2006
  Hyatt Regency
  Perth, WA, Australia
  e-mail: enquiries@informa.com.au

- ***EXPOMIN 2006***
  May 23–27, 2006
  Venue Espacio Riesco
  Santiago, Chile
  e-mail: info@fisa.com

The type of contract to be used will be chosen, which controls the project. Listed below are the basic types of construction contract delivery methods, which can be employed. Obviously, there can be derivatives of each type of contract delivery method.

♦ **Traditional Approach**
Generally, a linear-type of phasing (concept→engineer/architect design→ general contractor→ subcontractor) is involved with this method. Construction documents are usually and should be complete before construction. Contract options are such as to have a single general contractor, multiple prime contractors, or multiple primes assigned to a single general contractor. The construction contract may be negotiated or a competitive bid.

This approach generally does not incorporate the expertise of a construction manager during the design phase of the project. It is important to obtain accurate cost information before actual construction is initiated. The owner bears the burden of all major project costs before construction contracts are signed, and the contractor(s) bear the burden of the major risks after the contract is signed. Adequate schedules need to be generated and maintained to prevent delays in the construction process.

♦ **Design-Build**
This method has recently begun to gain recognition. Owners have sought to have a single point of reference; this delivery method provides a single point of contact who is responsible for all of the scheduling and coordination of the project. With this method, an owner contracts with a single firm, who may also represent many groups like engineers, architects and major equipment suppliers. This group will collectively plan, put into place, and control the whole project through completion and start-up. Essentially, the owner has little involvement in the project. A project can be started without the level of detail required under the traditional approach; the design-build team ensures required performance requirements are achieved.

The design build delivery method may be contracted on a cost plus, lump sum, fixed fee plus costs, guaranteed maximum price (GMP), or negotiated contract basis. The Design-Build Contractor may do a portion of the work or he may subcontract up to 100% of the work. Work is usually let by competitive bids.

Drawbacks to this approach can include the following situations.

- The owner loses control over the price, schedule, and technical matters.
- There is greater potential for conflict relating to changes and disputes over quality, performance, and scheduling.

♦ **Construction Management**
An alternative method to the Traditional or Design-Build approaches is utilizing a construction management delivery method. This method focuses on a construction manager who is responsible for the **entire delivery process** from concept to completion. He is a team builder who provides the necessary leadership to coordinate and integrate the skills and commitments for all disciplines in the project processes. He is the owner's representative who can fast track the design and construction processes, thus reducing the time and money to complete the project.

A CM may act as an agent of the owner in a service fashion or as an independent contractor under a GMP.
If the CM acts as a service provider the contracts are directly with the owner, the owner approves and enforces the schedule(s), and the owner directly pays the contractors and has authority over the trade contractors. A CM will work in conjunction with the architect/ engineers, but both are treated as independent entities by the owner. The CM acts as a fiduciary agent of the owner, provides leadership, provides his special skills to the project, is loyal to the owner only, supplies business administration, provides no guarantees of time and costs, will disclose germane information to the owner's best interest, and recommends certain actions to be taken to the owner.

A preliminary list of bidders will be generated. Permitting, bonding, funding and insurance requirements will be outlined, and the necessary processes will be initiated.

Preliminary Design to Final Design

The more work finished during this stage will aid both the owner and contractor in avoiding claims. Most contractors want to supply a quality product. One of the most common problems experienced by contractors is when the Scope of Work is not well defined by the owner.

The owner, architects, engineers, and construction manager should cooperatively establish design criteria, scope of work and specifications for the project. The better the drawings and

specifications are defined, the lower the risk to both the owner and contractor. Fewer questions and conflicts will arise during the construction processes if the time is taken to design and estimate the project in advance. Although architects and engineers' rates are expensive, the cost associated with time to properly design and estimate a project is less than construction overruns and legal cost created by claims. A good rule-of-thumb multiplier in terms of dollars for comparing the cost of not spending the design money to the cost of fixing or changing the project averages 10:1. An owner needs to keep this point in mind when evaluating the overall project budget.

Preliminary costs and an accompanying schedule should be generated as early as possible. Costs and schedules need to be updated on a periodic basis. Project Evaluation Review Technique (PERT) is a good method to identify the components of each construction task: materials, equipment, manpower, time to complete, and responsibility for each task completion. This step is very important because it defines the scope of each task. Each task will be composed of resources (material, manpower and equipment), time and costs.

After the project tasks are generated using a method like PERT, these tasks, which include time, resources, and costs should be incorporated into an overall project schedule and the Critical Path should be identified. The owner should perform the necessary economic analysis, which may include cost-benefit calculations, cash flows, and/or sensitivity. This information is critical for a number of reasons. Knowing the cost of the project will aid the owner in evaluating the bids. If the owner does not have the staff (resources) or time to do this evaluation, he should contract this evaluation to an independent company to assist in evaluating the estimated costs of the project. The owner will be better equipped to identify the critical path items, such as long lead times associated with obtaining specialized equipment.

The owner or his designated representative needs to be intimately involved throughout the conceptual to the final design stages of the project and scheduling processes. Communication is critical during all stages of construction, but communication during the initial stages of the project is essential. The owner must relay his needs and wants to the designers.

Award the Contract

Care should be given to organizing all design, specifications, equipment lists, material lists, labor estimates, drawings, and bid packages. A thorough analysis of the Request for Proposal should be completed before any bid packages are sent to qualified bidders. Time in defining an accurate Scope of Work will decrease any confusion in the bidding and construction processes. Written work specifications need to match the construction drawings.

Bidders need to be qualified, licensed, and financially stable with references thoroughly checked before any award of the contract is finalized. The general contractor's superintendent and foremen are critical in the efficient completion of the work. A good contractor will have experienced supervision personnel and also experienced people in the craft positions.

The contract needs to have sufficient time to submit a realistic bid. Many owners are in too much of a hurry to get started on their job, and do not give the contractor enough time to analyze and request information from the owner.

Begin Construction

After the all permits are obtained, the necessary licenses acquired, and the Notice to Proceed has been received by the contractor, physical work can begin. Your construction manager will be responsible for observing all work (QA/QC), administering the contract requirements, managing of change orders, coordinating the receiving of all equipment, materials, and manpower entering the construction site, reporting the progress of the job with progress/cost reports, responding to claims, processing payments and corresponding to all parties on various issues.

Standard of Care should be practiced by all participants of the project. *Standard of Care can be defined in a general sense as the implied agreement between the owner and contractor that the contractor enjoys that degree of knowledge and skill ordinarily possessed by others in the same profession or trade, **and** the contractor will perform the services for which he is engaged with the degree of prudence and care ordinarily possessed and obtained by others in the same employment.*

During construction the CM must be proactive not reactive. When requests for information, conflicts or problems occur, the CM must respond quickly to assess the situation. After the problem has been defined, an effective CM will respond with confidence and assertiveness and have final resolution of the problem. No issue should be taken as too small. The CM must treat all conflicts with diligence in resolving the conflict in question.

A CM must be able to create a team atmosphere between all parties involved in the construction project. Another job of the CM is to keep all of the egos of the personnel involved in a project suppressed. A successful CM will establish and maintain single points of contact for all companies involved in the project. The CM will enforce the established rules of the project with fairness and consistency.

A CM must know the contractor's schedule and require the contractor to maintain it. Contingency plans should be in place to compensate for issues that impact the critical path. A CM should know the designs as well as the architects and engineers. A CM who knows both the contractor's schedule and the designs will be able to keep the project schedule simple. He will have good understanding of the pitfalls associated with the project and will be able to monitor tasks and deliveries, which can impact the critical path for the project. An effective CM will be able to notify all interested parties in a diplomatic way of tasks that are either behind schedule or need to be fixed so they do not negatively impact the schedule.

One of the obvious signs of a construction project in disarray is one which is untidy. A CM should require the contractor to maintain a clean site. This requirement will improve safety and save money. Scheduling of shipments into the construction site need to be well coordinated and documented by both the contractor and CM.

Daily, weekly, monthly, and yearly reporting is critical. Depending on the size of the project the CM will make a number of different types of schedules and lists (estimated and actual), which will include, but not be limited to, material and equipment delivery schedules, manpower, project spending "burn" rates, critical path tasks, and meetings.

A quick note about meetings: meetings should be well planned in advance, be of a short duration, meetings items discussed should be posted in advance and an action list should be generated from the meeting with the responsibilities assigned to each action item.

Project Close Out

Punch lists are the typical tools used to determine the project completion and should be applied fairly to all parties. Final punch lists should be defined in the drawings, specifications, and scope of work. Both the owner and contractors should cooperatively establish a protocol of closing the construction project.

Vendors of major pieces of equipment should be required to be present during the installation and also during the start-up processes. Vendors are generally not utilized to their full potential. Vendors can often be helpful not only during plant start up periods, but also during the installation of vital equipment.

Documentation of major pieces of equipment, start up procedures, Material Safety and Data Sheets (MSDS), recommended spare parts lists and training of operators of equipment is usually underestimated. A competent CM will require in the contract documents comprehensive start-up and shutdown documentation is in place before the actual project is accepted by the owner. Accurate "As built" drawings should be an owner requirement from the contractor, engineers, and architects. "As built" drawings are important for future operators and owners, who were not involved with the actual building of the project.

Retainage of the final payment is one of the best ways by the owner to guarantee that the contractor complete their work with a Standard of Care.

In closing, all parties need to thoroughly read the contract and know their responsibilities. Good working relationships will be achieved if everyone knows their roles and responsibilities, and the contract does not need to be continually referenced during the project.

This month's article was provided by Stuart Collins, P.E., Senior Mining Engineer stuart.collins@pincock.com

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