

A Thousand Ways and Counting

Property Owners

Waste Millions

(5%-15%)

on Construction Projects

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Summary

This paper examines ways in which Owners waste money on their projects. It starts with the program, examines the design process, contractor selection process, site cost monitoring, pay application review, change order review and closeout. It recommends ways in which the Owner can minimize waste.

The underlying premise of the paper is that Owners must take responsibility for better controlling costs on their projects, that undertaking such responsibility is an investment which can generate substantial return to the project.

How?

- By adequately understanding the scope of the project.
- By understanding the cost of the project.
- By choosing the best design team for the project.
- By choosing the best construction team for the project.
- By properly monitoring and controlling the cost of the project.
- By properly closing out the project.

A Thousand Ways...

The title of this paper is inflammatory, of a purpose.

It depends upon how you count. If you take wasted costs in categories, as I will do in this paper, there are about ten categories of cost which result in wasting millions, or as the title says, 5-15% on the "normal" project. If one takes wasted costs as each instance, there are thousands of ways, perhaps tens of thousands of ways, Owners waste their construction dollars.

Over four decades of work in the industry, I have been involved with several thousand projects. They consist of myself and my staff for 25 years performing estimates on as many as 60 project per year for competitively bid jobs, to, in the last 15 years working primarily for owners, performing as many as 60 estimates on a single project. These projects have varied in size from several hundred thousand dollars to 2.5 billion. The projects have been located from Hawaii and Alaska, to the Caribbean, and include the majority of the contiguous 48 states. My staff and I reviewed thousands of change orders (over 6,000 on one project alone), numerous design proposals, hundreds of contracts, and thousands of construction drawings at various levels of completion (26,000 on one project alone.)

During the last ten years I have come to understand how money is wasted on construction projects. What I have found in most instances is that Owners are not fully aware of how their actions influence the final project results in negative ways.

My experience has led to an examination of the parts of projects which owners influence most and which when not properly carried out have resulted in wasting owner's money. This paper will discuss a number of these areas and recommend ways to correct them.

I want to emphasize that the party primarily responsible for wasting millions on projects, through both action and inaction, is the Owner. It is oftentimes from ignorance, sometimes from arrogance, and sometimes a combination of both. Some owners simply do not care about the downside of the status quo. I say this because many of the project controls this paper recommends could have been easily

implemented by now, yet they are the exception, not the rule. I have yet to find a project in which all, or even the majority, of these controls have been implemented.

As an introduction to how this examination began, let me cite two specific examples.

I was engaged to do detail change order review on a large project in the Midwest. Over the course of about a year, I examined 537 change order requests. Based upon my review of each with the contractor and its vendors, ("vendor" here meaning subcontractors and material suppliers) the difference between the price asked for and the price agreed was 44.4%, resulting in a savings to the owner of \$2,278,048, about 1.75% of the total project cost. The cost to the Owner for my services, about \$250,000, a 900% return on the Owners investment.

In another case on a 400 million dollar facility in the southeast, my staff and I reviewed some 6000 change order requests over a 30 month period. Total requested, about 100 million, total agreed, about 80 million. Total cost to the owner for these services, about \$1.5 million, a return on the Owner's investment of about 1300%.

To a great extent, the change orders presented in these two instances entailed changes in the design of the project. How these changes can be minimized will be discussed below. However, whatever the cause of the change order request, the vast majority were overpriced, a substantial waste of the Owner's money.

For a number of years the consulting company which I helped form and from which I recently retired kept statistics on the asked/agreed pricing of change orders on multiple projects. The average of all those was a 28% delta in the Owner's favor.

Change order requests have routinely (on good projects) run about 10% of the construction cost of the project. If those are overstated 30%, one fairly quickly understands that the waste is about 3% of the total project cost.

With change orders as the impetus, I began to examine other ways in which Owners waste their construction dollars. What follows is the result of that investigation to date.

Lump Sum vs Negotiated Projects

The issues examined in this paper result primarily from my experience with negotiated projects. Many of my clients believe that if they have the time, it is best to design the project and put it out to competitive bids. In many ways that is true, but the owner is exposed to waste on competitively bid projects as well. How this occurs will be addressed below. As one example, competitively bid projects are not immune from change order requests and to the extent that they are overstated they are a waste of the Owner's money.

Design

This section deals broadly with those activities which precede putting the proverbial shovel in the ground. It deals with the project program, budget, design team, etc.

Construction Program

There must be an idea to start. It may originate on the back of a cocktail napkin or be a multiyear master program, parts of which get moved up in the queue on a regular basis. It is the translation of the idea into a space program where problems often begin to develop. "Program" here means a listing of the spaces needed to fulfill the idea.

The more detailed the program the more opportunity to carefully think needs through. The more detailed the program, the more sets of owner eyes can view it, and the less mistakes made. A laboratory building, for example, will require the input of the scientists who use the space, the administrative staff, the custodial staff, and the building facilities staff. If there is food service, the food service staff will also need to be consulted. Oftentimes one or more of these user groups are left out of the programming phase. Prior to engaging a design team, the owner should have as clear a view as is possible of its space needs in as much detail as the owner can generate.

In addition, during this period the owner can begin to conceive of the character of the facility. What type of facility conveys the owner's vision for the project. Is it a Mayo Clinic or a neighborhood clinic? Is it stately or utilitarian?

This preparation work serves a number of useful purposes, the most useful of which is the owner developing a thorough understanding of its needs. To the degree that the owner does not have a thorough understanding of its needs is to the degree that it may waste its money, or put another way, it is during the program development phase of a project where changes can be made most cheaply. Changes made during the following phases of the project become progressively more expensive, the most expensive of which are those made during construction, as noted above in the change order example.

Program Budgeting

Budgeting at the program level should be a parallel effort with programming. It is not sufficient to say that the owner has a 100,000 square foot facility which will cost \$150/square foot. Each of the various types of spaces in a facility has its own unique cost and budgeting each space properly will result in a more accurate budget overall. In the lab example, the lab space may be \$300/square foot in the aggregate while the administrative space may be \$150/square foot and the custodial/mechanical/electrical space \$90/square foot.

I divide program estimates into four general categories. They are "core and shell," "interior fit out," "equipment," and "FF&E." There are differing definitions of these categories of cost between different clients and the terminology must be clearly understood in each case. For the purposes of this discussion the following descriptions will be used.

Core and shell includes building foundations, structure, exterior closure, mechanical and electrical systems, conveying, and interior unfinished partitions. Interior fit out includes the finishes for the walls, floors and ceilings of the spaces provided in the core and shell budget and the millwork for those spaces. Equipment is the fixed equipment required for the space. In the lab example, the laboratory spaces would have lab equipment, the kitchens would have food service equipment, the laundry (if in the program) would have laundry equipment, etc. It should be noted that in this definition the mechanical and electrical equipment required to make the building function are included in the core and shell values. FF&E is described as moveable furniture, fixtures, or equipment. In the lab example, office furniture, artwork, window coverings and such items are included in FF&E.

Budget values for each of the program spaces may be determined by experience or by analysis, or more likely, both. The experienced estimator knows what costs have been incurred on past projects or he or she can analyze the elements of each category and develop costs per square foot.

The advantages of such an approach are in some ways analogous to the approach described in the programming section above. The budget will be more accurate and the owner will understand its various elements better and so gain more confidence in it.

Every program budget should contain a line item for contingency. I recommend a contingency which depends on the depth of program analysis. There are two principle types – a program contingency measured as a percentage of the total program area and a budget contingency based on the dollar value of the budget. Program contingencies should be based on the owner's past experience of program

growth and the budget contingency should be based on the level of confidence the owner's team have in the budget. Ten percent in each category is not uncommon.

The principle advantage of this type of program budget is that it can be updated very quickly as the program evolves. For example, one of my clients during the design of a \$900 million facility issued program updates each month. I took the program updates, updated the program budget within 24 hours and reissued the budget to the project team. In this way, all of the members of the project team were continually aware of the cost ramifications of changes being made.

Designer Selection

Only after the owner has accomplished the steps described above should it initiate the process of selecting a design team. This is not to say that the owner should not engage the services of design and cost professionals (these should be separate and independent firms so as to maintain the maximum level of objectivity and arms length) to assist in program development and program budgeting, but those professionals should be engaged for specific functions in each area and not granted expanded roles related to design and costing.

When the owner is satisfied with its program and budget, it should issue a formal Request for Proposals for design. The design RFP should be detailed as to program, budget, the owner's vision for the project and the requirements for designer selection. These requirements should include

- the design deliverables for the project, (a less than complete list of design deliverables leads to misunderstanding the status of design both with respect to payment of fees and to design document completeness),
- a graphic representation the design each of the proposers would recommend,
- the owner's schedule for design by major deliverable date,
- the fees for design,
- the consultants proposed by the lead design firm,
- the qualifications of each consultant,
- and the individuals proposed by each team member (along with their qualifications) for the project.

The RFP should include the form of contract the owner proposes to use for design of the project. This allows the proposers to review and comment on the proposed contract during the RFP process, speeding up the design process when the successful proposer is chosen. The Owner should develop a scoring or evaluation matrix for the proposals received with the appropriate weights for each category being evaluated. The process may include a prequalification phase during which the potential proposers can demonstrate their qualifications so that the list of proposers can be narrowed to only the most qualified firms, thus saving the owner and the proposers time and money.

In recent years there has been a tendency for owners to focus excessively on the fees proposed by design teams. Overemphasis on design fees to the detriment of qualifications and design deliverable requirements leads to increased costs of construction. Paying an unqualified design team one percent less in design fees (as a percentage of the project cost) may lead to a ten percent added cost of construction because of poor design documents

The RFP should also include a detailed breakdown of the fees the design team proposes. While the overall design fees for the team may be adequate, their distribution may reveal potential problems. If the architect has adequate fees and the structural engineer is substantially under funded, construction costs will surely increase as a result of inadequate or incomplete or uncoordinated structural drawings. Been there, done that.

The owner should, after receipt of the design proposals, conduct thorough interviews with each of the proposers. The interviews should be of sufficient length to allow the owner to develop its own comfort level with the design team's understanding of the project and with the individuals who will be working on

the project. The overriding purpose of the RFP process is for the owner to select the best qualified design team with a reasonable fee and with whom the owner feels it can most successfully interact.

Remember, the fee proposed, if in the competitive range, should not be the decisive factor in selection. Ability to produce a complete and coordinated set of construction documents according to schedule is the most important factor.

As a gesture of good faith and to assist the design teams in defraying costs of submittal the owner should consider compensating each proposer team for its efforts.

Designer Contracting

As stated above the owner should include its proposed form of contract with the RFP. The contract should contain all the elements of the RFP, design schedule, fees, insurance provisions and deliverables. It should also contain provisions for the owner's remedy if the design team does not produce the correct level of documents on the correct schedule and in many cases language which obligates the design team to design to the owner's budget or redesign for no added fee.

Design Estimating

It is critical that the owner engage the services of a competent cost consultant to monitor the progress of the design as compared to the budget. This consultant should be contracted directly with the owner and independent of the design team. This allows both another set of eyes and often a more competent set than is possible if the design team has this responsibility. The owner should issue an RFP for these cost consultant services as well, setting out the schedule, deliverables, level of detail and format of the estimates, along with requirements for regularly scheduled meetings between the consultant and design team at all stages of design, including in depth review sessions between the owner, design team, and cost consultant at each of the major deliverable dates. These major design and cost milestones should include at a minimum an estimate at the end of conceptual design, schematic design, design development and construction documents.

The cost consultant chosen should demonstrate its experience and ability to estimate the type of project contemplated, the appropriate estimating system to be used, the ability to estimate all construction disciplines at all levels of detail, its ability and experience in value engineering studies, system critique, and its ability to communicate its findings on an ongoing basis.

The cost consulting area is another in which the Owner should not be principally concerned with fees but with results and value received. Using a competent cost professional will result in the owner saving many multiples of the fees paid to that consultant.

Contracting Methods and Contractor Selection

There are a number of methods available to an owner to contract for construction services. These include lump sum bidding, cost of the work with a fee, cost of the work with a fee and a guaranteed maximum price, agency construction management, multiple prime contracts, etc. Many public owners are mandated by law to use lump sum bidding and to accept bids from any firm who meets certain criteria and can produce a bid bond and a payment and performance bond.

All of these methods have their pros and cons. Lump sum bidding to essentially all comers has the traditional advantage of engendering the maximum amount of competition, which supposedly results in the lowest price. This view has in recent years come under substantial scrutiny because the initial bid is oftentimes not the final price when the owner adds in the cost of change orders. The existence of and pricing for change orders will be discussed further below but it has been a topic of heated debate between owners and construction team members for some time.

In addition, lump sum bidding leaves the owner very little flexibility in choosing the best construction team for the project. Some of the factors which may affect lump sum bids are the number of bids received, the amount of subcontractor and material supplier competition, the ability of the bidders to perform in a timely and cost efficient way, the personnel with which the project is staffed by the construction team, etc. In short, the owner contracts on the base of price alone, which is often not the best practice. If the owner uses multiple lump sum prime contractors on the same project the problem is likely to be compounded.

A better method for contracting for construction services is often one of the several types of negotiated contract methods, the best being the cost of the work plus a fee with a guaranteed maximum price provision.

Some of these types of contracts also include shared savings clauses which specify that the contractor and owner split any savings under the guaranteed maximum price according to some percentage formula. I do not recommend these types of clauses for two principle reasons. The first is that the construction team chosen should be professional enough to need no extra incentive for performing and the second is that the shared savings clause oftentimes becomes an incentive to attempt to make the guaranteed maximum price higher than it should be so that there will be shared savings and extra fee for the construction team.

Absent the shared savings clause, the advantages of this type of contract, properly managed by the owner, are many.

- The owner may prequalify firms to propose on its project in the same way as discussed above with regard to design firms.
- It may ask for information about a firm's operational and financial ability to perform the project in the time frame the owner wishes.
- It may require references from other owners for whom the contractor has provided similar construction services.
- It may allow the owner to prequalify not only general contractors but also vendors, so that at the end of the process the owner has satisfied itself that it has a large enough construction pool to engender competition and that the competitors are all capable of performing the work.

The method also allows the owner to issue a request for proposal rather than a request for bid. This enables the owner to ask the proposers to provide substantially more information with the proposal than would otherwise be possible. Such information includes

- the contractor's proposed staff, overhead pricing, detailed estimates for the cost of the work,
- contractor's fee, and the fees proposed for each of the contractor's vendors
- proposed vendors with their detailed pricing information and staffing,
- a proposed construction schedule,
- assumptions and clarifications it has to its proposal.

The proposals should be submitted and opened in private, allowing the Owner sufficient time to examine them in detail so as to understand them clearly. It also allows the Owner to conduct in depth interviews with each proposer including its major vendors, to not only satisfy itself that the proposal is fair and complete but also to gain an impression of the working relationship which is likely to develop between the Owner, designer, and construction teams. Owner staff, designer, and cost consultant should be included in these interviews as they will be required to interface with the construction team as well.

This process leads the Owner to choose the best construction team for the project, to provide itself with necessary and complete information about the proposals and to develop consensus among the team members as to the right choice. It also affords the owner team an opportunity to clarify uncertain areas and to negotiate changes to the construction team's proposal if necessary.

It should be understood that the selection of the contractor is the beginning of the process. Owner agreement to contractor fees, staffing cost budgets, vendors and their fees and budgets, etc., follow, leading to the negotiated contract price.

Arriving at Negotiated Contract Value

This is the phase of the project during which the Owner arguably wastes the most construction dollars.

You will recall that these contracts are based upon the “cost of the work” and a “fee.”

Cost of the work will be discussed below, but let’s start with a discussion of “fee.”

“Fee” and “profit” are often used synonymously in this context. For the purposes of this discussion I will use the word “fee” as the amount the Owner pays its contractor and vendors in excess of the cost of the work. It is a contribution to a company’s home office overhead and potential profit before taxes. If a company earns a fee of \$1,000,000 from this project, it will deduct the expenses of operating its home office from this fee to determine its profit before taxes. In other words, “fee” in this context is a contribution to the company’s “overhead and profit.”

Why is this distinction important? Well, for two principle reasons.

First, many Owners have a relatively clear idea of what the fee for the general contractor should be on negotiated projects. This fee, over the last decade or so, is “known” to be in the 3-4% range, sometimes slightly more or less. By the same token, many Owners have only a vague notion of the range of fees which should be paid to vendors.

Both notions are potentially costly to the Owner, for different reasons.

Let’s look first at the general contractor fee notion, 3-4%. Can most general contractors make a decent “profit” if all its projects generate, say 3.5% “fees.” In most cases, probably not. For most general contractors “fee” must be in the 5% range in order for the contractor to make a “profit” of 2%, or an after tax profit of a bit above 1%.

Here is the Owner’s Catch-22. The contractor proposes a “fee” of 3.5% but needs 5%. Where does the extra fee come from? From collecting an inflated cost of work, that’s where. And how is the cost of work inflated? Well, here are some ways.

- General Liability Insurance costs billed in excess of actual cost.
- Salaried staff costs billed in excess of actual cost.
- Company owned rental equipment and tools charged in excess of actual cost or fair market value.
- Craft wages billed in excess of cost.
- Added “fee” on work performed by the craftsmen of the general contractor.

Bottom line, the Owner agrees to pay a fee, then pays what amounts to added fee as a cost of the work. Maybe 1.5%, maybe more.

With regard to vendors, what fee should the owner agree to? Here the question has potentially many answers, but the one sure answer is one fee does not fit all vendors and all fees are negotiable. Certainly the risk of added fee paid as cost of the work in the items listed above for general contractors exists and is paid by Owners routinely, and methods for avoiding paying extra fee in items such as those listed above will be discussed below, that is how the Owner can pay only the true cost of the work and

not waste money on fee disguised as cost of the work. But here we focus on the “fee” the Owner agrees to pay vendors.

How can the Owner educate itself on the market rate fee for each classification of vendor?

While there are some rules of thumb, for example the larger the vendor contract the smaller percentage fee, the best way to test the market is to inform vendors through the general contractor what is allowed for cost of the work and solicit multiple fee proposals from multiple vendors in each work category. This should be done as part of the vendor selection process as it was done as part of the general contractor selection process.

As an alternative, the Owner may wish to specify the fee it is willing to pay vendors as part of the solicitation process and see what happens. If the fee is too low for some vendor classifications, the competition may be less and the resulting cost of work higher. If it is too high there may be many vendors willing to compete, but the Owner will have still paid too much.

I prefer letting the vendor submit the fee proposed in the overall proposal process, the Owner having the benefit of multiple vendor proposals as a basis for forming an opinion. In any case, the Owner can require the vendor to provide justification for the fee proposed.

Remember, all fees are negotiable until the Owner and vendor agree on a fee. To put the magnitude of the issue in perspective –

On one project the Owner agrees to an across the board fee for subcontractors of 15%. The stated reason was “fair market value.” Problems developed with the pricing of one of the major subcontractors as the job progressed and other proposals for the scope of work were solicited by the Owner. The Owner chose a subcontractor who was willing to perform the work on a shorter schedule and for a 10% fee, rather than 15%. In addition, the cost of work proposed was some 30% less than the original subcontractor but in terms of fee, the Owner saved 33%.

Now the total amount of subcontracted work on the project was about \$180 million. At 15% fee, total fees were \$27 million. Suppose the Owner could have contracted the other work at a 10% fee – savings to the Owner \$9 million. I am not saying this would have been achieved, but what I am saying is it was never even tried. Most certainly, as the example above shows, savings would have been possible.

With respect to the cost of work component of the project negotiated contract amount, I reiterate the point made several times above, that the Owner must have an informed opinion as to the value of the cost of the work for each category of work in the project and must be in a position, having determined its own value of the work independently of the vendor, to conduct a detailed review of the detail estimates provided by the vendor. “Detail” here meaning, for example, cubic yards of concrete, square feet of formwork, square feet of drywall, linear feet of stud, pounds of ductwork, linear feet of piping, etc. as would be contained both in the detail estimates of the work provided the Owner by its own independent cost consultant and by the vendors who are competing for the categories of work.

This detail estimating and review process has many advantages, the most important being that it allows the Owner to make an informed decision as to the vendor most qualified, but also that the process shows the construction team that the Owner has the knowledge of and capability to evaluate cost so that the construction team tendency to attempt to bill in excess of the true cost of the work may be somewhat minimized.

Jobsite Cost Control

This is an area where construction owners waste huge amounts of money, particularly on cost plus projects. The owner places in the hands of others the responsibility to provide accurate information about the number of workers on the site each day, the supervision each day, the amount of material

delivered to the site each day, the intra company and third party rental equipment resident on the site each day, and the owner is asked to pay for all this, about 80% of the contract cost, in the belief that it is receiving accurate and timely information from the contractor and its vendors.

This responsibility is often misplaced. Relying on others to provide all this information is a bit like the fox in the henhouse. Even to the extent all of the vendors and the contractor want to provide accurate information, belief that 1) all will do it accurately and 2) that all want to do it accurately is very shortsighted on the part of the owner.

As an example. How many craftsmen are on the site today? When did they arrive, how long did they work? How many of the construction vendors have any method of attendance verification other than the old time method of counting noses, seeing what time the noses show up and being aware of what time they leave. It is rational to believe, on a project where there may be hundreds of workers for which the owner is asked to pay each day, when some may be working overtime, some ten hour shifts, some eight, some the night shift, some weekends.....that all the noses are perfectly accounted for each day? Is it rational for the owner to rely on others for this information without independently verifying it, since labor cost is 40 to 50% of the overall project cost?

Another example, how much material was delivered to the site today? Who bought it, who signed for it, what is it for, and how does the owner know it is getting the best price for it? Thousands of truckloads of material arrive on site over the course of large projects, totaling probably 35-45% of the cost of the project, and most owners rely on others to verify the accuracy of the information they compensate the construction team for. I have been involved with projects where the pay application review showed invoices from vendor suppliers which were clearly marked for other projects, included "in error." While it is understandable that errors are made, the invoices still wound up in the pay application to be discovered by Owner staff review.

Another example, truckloads of equipment show up at the site every day. Equipment in the sense of that used to construct the project as opposed to that which is built into the project itself. Cranes, forklifts, man lifts, small tools, etc. Who orders this equipment, who signs for it, who tracks its cost to the project on an ongoing basis. On one project I was involved with, the owner was asked to pay for over a million dollars of small tools – drills, impact wrenches, compressors, and the like – pay for these tools outright. At the end of the project most of those tools could not be accounted for. Another project had millions of dollars of third party rental equipment, man lifts, dozers, cranes, etc. rented. The owner, again, relied on the contractor and its vendors to properly account for the equipment, maybe 10% of the total value of the project. Was it tracked and accounted for properly? In my experience, oftentimes not.

If 80% or more of a project is in these categories, and there are errors made in accounting for these costs, unintended or intended, what might be their magnitude.

On one project I reviewed nine monthly pay applications to determine whether the written instructions of the owner regarding cost documentation were being followed in documenting pay applications. The instructions included certified payrolls, purchase orders, receiving tickets (legibly signed) for material and equipment matched to invoices. More about this in the section Reviewing Pay Applications. The monthly pay applications ranged from \$7.5 million to \$20 million. Costs not properly accounted for in each pay application totaled several hundred thousand dollars.

Were these undocumented charges legitimate or were they not? In my view, some of both. But how does the owner know, unless it verifies.

Someone said, Trust but verify. That saying is appropriate.

How does the owner verify, what does it cost, and what is the return on investment?

That discussion follows.

Prior to the specifics, I should emphasize a point I touched upon earlier. As I write this, the country is in the midst of a recession. Many of my owner clients who are building expect their costs to fall rather dramatically due to economic conditions and see little need to use the types of systems described below to verify their costs. That view could not be further from reality. During tough times construction companies often bid and procure work for less just to keep functioning. To whatever extent there is a tendency among some companies to fudge costs for the sake of a larger fee during good times, that tendency is accelerated exponentially during tough times. Some companies view fudging as a necessity during tough times. One example of this is the rise in the number of change order requests during downturns. As one subcontractor stated to me, "I can't get my fee in the bid because work is too cheap, I have to get it in change orders." Well, maybe not only there but also, perhaps, in charging too much for labor, material, and equipment.

The absolute key to jobsite cost verification control is access control, access control, access control.

There are many reasons for access control besides cost verification which make access control crucial. Safety is one, vandalism another. But here I will discuss cost verification only.

The owner must control and verify who and what has access to its project. How is this done? The site must be secured and access points rationally provided and continuously monitored. There may be several, but all must be continually monitored. There must be primary access points to the site and there maybe secondary access points to the work. For example, workers may park on site and should be monitored at the primary point for being allowed on site. They may park their vehicles and walk to the place they are currently working that day. A secondary access point is established to verify the identity of each worker and the time he or she reported for work, i.e. the time the labor charge begins for the day. Similarly at the end of the day the process works in reverse. The owner is thereby able to determine precisely who is on site, by whom the worker is employed, and what hours the worker spent on site that day. The owner can use this information when reviewing the contractor's pay applications to determine whether it is being correctly charged for craft labor.

With respect to tools and equipment used during construction, each piece of equipment and each tool should have attached to it when it arrives on site a bar code which identifies that equipment or tool. The responsibility for affixing a bar code tag should be the responsibility of the company which wants to be compensated for its use. The tag is scanned into a database which is controlled by the Owner. The Owner will maintain the database listing each piece of equipment and each tool by vendor, and will use the database to verify the accuracy of charges for these during pay application review. Periodically, the Owner's staff and vendor's staff will conduct an after work hours inventory of tools and equipment, scanning the bar codes attached to each piece to determine the accuracy of the database. In short, if the tool or equipment is not in the database, it will not be paid for by the Owner.

In addition, at primary access points established by the Owner, the Owner will have its own clerk of the works inspect each delivery of tools and equipment to ascertain both the nature of the delivery and the vendor to whom it is intended. Delivery tickets, (and pick up tickets when the tool or equipment is removed from the site) will be collected by the clerk for use in pay application review.

As an aside, you will recall the discussion above about the negotiation of fees. That discussion is applicable to the rental rates charged the Owner for vendor owned tools and equipment. Rates for each tool and piece of equipment should be negotiated with each vendor for these items, the starting point for negotiation being the value established for the item using a nationally recognized pricing authority such as Blue Book. When the value of the rental charged for the item reaches some percentage of its Blue Book value, rent stops, or the tool or equipment becomes property of the Owner. The Owner will maintain a database of each piece of equipment or tool provided by vendor and will verify that the total rental for each has not reached the maximum value allowed or disallow the charge if the maximum value has been exceeded. I have had experience on projects where the total rental charges for a piece of equipment or too have been demonstrated by audit to have been two or three times the value of the item. Excess fee, excess fee, excess fee.

With respect to material delivered to the jobsite, the Owner will require the vendor responsible for ordering the material to provide it a purchase order for the material and a legibly signed receiving ticket showing vendor personnel inventoried the material and vouches for the accuracy of the quantity received.

In addition, the Owner will, at primary access points to the project, have its own clerk of the works inspect the material delivery for a cursory overview of the nature of the material and the vendor to whom it is to be delivered. The clerk will maintain a copy of the delivery ticket for use in pay application review.

Pay Application Review

Pay Application Review – Lump Sum Projects

There are two construction accounting terms with which every Owner should be familiar. They are “billings in excess of cost” and “costs in excess of billings” or similar terms. For our purposes we will use “overbilling” for the first and “underbilling” for the second. Overbilling is construction industry manna from heaven. Underbilling is anathema.

Traditionally owners have used retainage, the withholding of a certain percentage of the periodic billings as a reserve, leverage if you will, to insure that their projects are successfully completed. Standard practice has been to withhold 10% of periodic billings as retainage, with portions of the retainage being released at intervals during the construction cycle. To offset this requirement, many construction firms seek to overbill the owner during the early phases of the billing cycle, in effect billing for work which is not yet performed.

This practice is particularly widespread on lump sum construction contracts. These contracts often allow billing on a “percentage of completion basis.” The billing states that the overall project is, say, 25% complete, so the billing reflects 25% of the contract amount. How does the owner verify that this percentage is correct?

Most owners use the method I describe as the “wet finger to test the wind direction” method. If the project looks about 25% complete, they approve the billing. More sophisticated owners require a detailed “schedule of values” for the project be presented and approved prior to the beginning of construction. If properly prepared, the schedule of values allows the owner to test the billing against construction progress, in effect verifying individual parts of the project completion.

Given a schedule of values which has the requisite level of detail, this is a useful method of verifying project percentage of completion. The operative terms are “requisite level of detail.” If the owner is building a hotel, for example, it would want to know what the value of each floor is and furthermore what is the value of each of the components of that floor. For example, what is the value of the concrete formwork for the floor, the reinforcing steel for that floor, the concrete material for that floor, the exterior skin of that floor, the drywall for that floor, the various finishes for that floor, the mechanical work for that floor, etc. Each of these work categories can be as detailed as the owner wishes. For example, formwork can be broken into column forms, wall forms, floor forms, etc.

This level of schedule of values detail allows the owner to independently determine to what extent the work has been completed if the schedule of values is accurate. In my experience, schedules of values are “front loaded,” the early activities are overpriced, and the late activities underpriced, which results in overbilling. How can the owner independently verify that the schedule of values is correct?

Recall that the owner’s team includes a competent cost consultant who has prepared estimates at various times during the design process. That consultant will have prepared a detailed estimate based upon the 100% complete construction documents either before or concurrent with the project being put out to bid. That detailed estimate has many uses, among which are evaluating the bids received and the evaluation of the schedule of values to ensure its accuracy.

Is all this a big to-do about nothing? Here is a 50 million dollar project which will take 2 years to complete. The owner is overbilled 10% for the first year. What is the time value (or interest cost) of 5 million for a year? You decide.

Pay Application Review – Negotiated Projects

It is absolutely essential that the Owner establish at the earliest possible date in project the requirements for pay application documentation. They will include the requirements for certified payrolls, for example, and for copies of material and equipment invoices backed up by legibly signed receiving tickets, copies of purchase orders issued for the item, etc. The Owner can then compare its own information gathered as discussed above to verify the accuracy of the charges billed.

These requirements will follow from the Owner's "philosophy" of cost reimbursement. "Philosophy" here refers to the Owner's view of when a cost becomes a cost. Is it when it is submitted to the Owner or when it is actually paid by the contractor or its vendor?

As an example, do labor costs consist of a billing for the number of hours worked multiplied by a billing rate, or do they consist of the actual wages paid to the worker, the federal taxes submitted for a payroll, the fringe benefits contribution made to the union, etc.? The documentation in the first instance would consist of certified payrolls and a tabulation of the hours worked by the applicable billing rate. That in the second instance would consist of the payroll ledger for the period, the federal and state tax reports for the period, union contribution reports, in each case accompanied by proof of payment. The first method might be described as the "costs paid and anticipated" method and the second as the "costs paid" method.

Or in the case of billings for materials – is the billing to reimburse only those costs the contractor and its vendors have paid or does it reimburse those the contractor and vendor warrant have been incurred and will be paid?

In summary, when does a cost become eligible for reimbursement, when it is incurred, or when it is paid by the construction team?

This is a significant issue. Using the "cost incurred" method for reimbursement, the Owner is agreeing to reimburse costs which may or may not have been paid by the construction team. In the "cost paid" method, the Owner is reimbursing only those costs which the construction team demonstrates that it has actually paid. One might reasonably expect the method chosen by the Owner to have a significant effect on project cash flows.

The amount of information provided with a pay application for a negotiated project using either method of reimbursement is orders of magnitude greater than that provided on a lump sum pay application. This vast difference is both a challenge and an opportunity to better control costs.

The Owner will have through its cost consultant determined the fair market value of the negotiated contract amount as discussed above. The owner will have performed detailed estimates of all the elements of the work and will have received from the contractor and its vendors detail estimates for the work and will have conducted in depth interviews with the contractor and its vendors to reach agreement on the negotiated contract price.

This process allows the Owner to gather extensive and invaluable information for monitoring the cost of the work, including reviewing pay applications. The Owner will know what the contractor team proposes to charge for labor, material, and equipment in detail. Part of pay application review involves comparing actual costs to estimated costs. The Owner will have reviewed proposed contractor and vendor fees, negotiated them if necessary, and will be able to determine if the fees charged in the pay application are correct.

Labor charges will be verified against the database discussed in the section on monitoring site costs above. Material invoices will be checked to verify both purchase order values and receiving tickets signed by the clerk of the works and the vendor representative. Tool and equipment invoices will be matched against receiving tickets, jobsite inventories, and database logs maintained by the Owner to insure the accuracy of these charges in the pay application.

Any discrepancies between the logs for labor, material, tools and equipment discovered in this review process will be deducted from the contractor's next pay application.

Change Order Review

As was noted above, the issue of change orders has been a contentious one for many years and with valid reason. Owners believe there are too many change order requests for their projects and that the pricing for them is inflated. While even in the best of design documents there are valid reasons for change requests, for example if the owner for good business reasons decides to modify its program or change the function of a space or use a different material in a given location, the fact is that construction documents are produced by fallible human beings who make mistakes. For these reasons change orders are to a certain extent to be expected. However, a voluminous number of change orders points either to the fact that the owner did not program its facility adequately or accurately or that it chose the design team for the wrong reasons and the design team did not perform satisfactorily.

With respect to the pricing of change order requests I mentioned earlier, it has been my experience that the owner's concerns are well founded.. In my review of thousands of change orders on hundreds of projects I have found that properly evaluated the vast majority of change orders requests are overpriced, as I stated earlier.

I must stress that this process of review is a comprehensive effort of the owner's staff or cost consultant to independently define the scope of the change, quantifying it, and estimating the change in the same level of detail as would have been performed on the estimate of the 100% construction documents. A comparison of the owner's detailed estimate for a change with the contractor's detailed estimate is the best way to evaluate the rational value of a change, since it has the effect of two sets of eyes looking at the same change and rather quickly informs the construction team that change order review will be a meticulous process. Any construction contract of any type must include language that all change order requests be accompanied by a sufficiently detailed estimate that such a comparison can be made.

Schedule Review

The owner should have the capability, or procure it from a schedule consultant, to periodically review the construction team's schedule in detail. The owner should independently form its opinion about whether the project is on schedule and whether the remaining work to be done on a project can be done in the time allotted. While many owners feel this is the work of the contractor, to the extent that the contractor fails to prosecute the schedule in a rational and orderly way is to the extent that the owner may be involved in a request for change order and subjected to the risk of financial loss.

If a project has not been managed properly and the completion date is approaching there may be a need to add manpower, increasing costs and decreasing efficiency. Should this occur and not be anticipated the construction team will seek to be compensated for these types of costs and often this results in claims and large legal expenses. If the owner is not intimately aware of schedule status it may be rudely surprised when the claim comes and be ill prepared to deal with it.

As an aside about what I call change order requests gone bad, it should be noted that claims are noteworthy as much for the cost to adjudicate them as for the amount sought without legal fees. It is not uncommon for the legal fees and associated costs to be a significant portion, if not the majority, of the final settlement amount. This fact points out that the best policy is to settle such matters before they reach the claim stage.

Closeout Procedures

Another area in which the owner may save money (not waste it) is in having a very clear set of closeout procedures. These should include a detailed list of the owner's requirements both in general terms and work category by work category. The requirements should be tied to the construction schedule and should have monetary consequences if not met in the appropriate time frame with the appropriate level of documentation. It is the owner's obligation and in the owner's best interest if the requirements are detailed, straight forward and issued in a timely fashion. It should be noted that one of the responsibilities of the owner's staff is to monitor the process, review the submittals for timeliness and completeness, and work with the construction team to complete the process in a timely way.

As another part of the closeout process, the Owner should reserve the right, prior to final payment, to audit the financial books and records of any of the construction firms on the project, and to perform the audit to any level of detail it deems appropriate. The primary purpose of the audit is to establish to the Owner's satisfaction that total billings do not exceed allowable cost of the work plus the agreed fee. If the Owner's audit discovers substantial differences between the two, not only will the overage not be paid, but the Owner may expect to recover the cost of the audit from the vendor in question.

Record Documents

Owner requirements for record documents are almost universal and to a great degree standard from project to project. As built drawings, specifications, submittals and operation and maintenance manuals are basic requirements. The accumulation of these documents, their cataloguing and storage are responsibilities of the owner's staff. In many cases, however, the tasks associated with record documents are not performed in a timely nor complete fashion with the result that facility staff does not have all the data needed to manage the facility for the long run. In the case of record documents the design profession has developed good requirements in great detail. The problems typically arise when the owner does not manage the process of timely receipt of the record documents and timely storage of same.

The Owner should require receipt of all record documents, reviewed and accepted by appropriate Owner staff, as a condition of final payment to the contractor or its vendors.

Owner Staffing

Many owners seriously underestimate the staff required to represent its interests fully during the construction process. While the size of the owner's staff varies according to the size and complexity of the project, the staff must be both adequately sized and of professional experience to fully represent the owner's interest on a daily and hourly basis. Issues which arise daily affect the outcome of the project and the owner cannot assume the construction team will represent the owner's best interest. The reality of the construction market is that the construction team's highest goals are to minimize its risk and maximize its fee. For an owner to fail to appreciate this fact and be able to competently and professionally respond to construction issues as they arise is potentially the largest way in which an owner may waste money on a construction project.

The Owner should view the composition of its staff as an investment, from which it should expect a dividend. The owner's staff costs should not exceed 2% of the project construction cost on most projects. If the Owner saves even 5% of the cost of the project by adequate staffing the investment yields a 150% return. If 15% savings are achieved, the return triples.

Conclusion

I trust that the discussion above has reinforced our conclusion that for the construction owner to minimize its exposure to wasted construction dollars it must be committed to doing an excellent, professional job in all the areas noted. In so doing it will minimize the amount of money it wastes. Which brings us full circle – construction dollars not wasted equal construction dollars saved.