

CONSTRUCTION PROCESS PLANNING AND **SIDNEY M. LEVY** MANAGEMENT

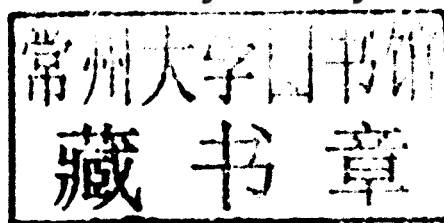
AN OWNER'S
GUIDE TO
SUCCESSFUL
PROJECTS



Construction Process Planning and Management

An Owner's Guide to
Successful Projects

Sidney M. Levy



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Preface

Traversing the design and construction process, even for an experienced hand, is sometimes daunting. When dealing with unfamiliar terminology and professionals in the field of architecture, engineering, and construction, project owners may need some guidance along the way and, at times, wish they had a relative in the building business to provide them with some helpful tips.

That is the purpose of this book: to offer project owners who are new to the design and construction process some firsthand experience from someone who has been in this business for 40 years, and, for owners who have been involved with many projects, perhaps shed some new light on problems they may have encountered previously and wish to avoid in the future.

Of fundamental importance in this process is the establishment of a good working relationship with the architect's team and the contractor. In the heat of a stressful moment during either design or construction, these strong relationships will prevail, resulting in a reasonable approach to a reasonable solution. Being able to view that difficult situation from the perspective of others is another trait that takes on added importance when hundreds or tens of thousands of dollars are at stake.

An owner has a right to expect professional performance from the architect and contractor. After all, they have committed or will shortly be committing significant funds to each of these professionals. The architect and engineers will in turn be committing their staff and their reputation to the design of your building, and in today's complex building systems, incorporating compliance with a multitude of local, state, and federal rules and regulations, and that is a mighty task.

Selecting an architectural firm specializing in the type of project being considered and interviewing their past clients are two ways to move toward a well-designed project. Visiting some of those recently completed projects can give an owner an opportunity to look at the architect's work and talk to those former clients to learn a little bit more about their experience working with that architect. Because the relationship between architect and owner is a close one, the client must feel comfortable with the design team.

A contractor can be selected first by offering bid documents to a selected group of builders, and, second, upon selection, negotiating the final terms, conditions, and contract sum. Contractors work on slim profit margins, and most try to control their project by monitoring their costs closely. And most reputable contractors will assume some responsibility for minor contract obligation interpretations. Owners driving a particularly hard bargain with the contractor may find that there is little "wiggle" room left for the builder.

An owner should consider selecting a contractor on the basis of reputation and not solely on the bottom line. Integrity and excellent past client relationships are the hallmarks of a successful, competitive contractor. A good working relationship between the design team and the contractor can be promoted and encouraged by the owner, since this is an essential element in a successful project.

Owners must be as fair in their dealings with their design and construction team, as they expect those members to be fair to them. The three tenets of a well-executed construction project can be summed up in three words: fair, responsible, and reasonable. An engaged and knowledgeable owner is a prime requisite for a successful construction project, and hopefully this book will make those tasks somewhat easier.

Sidney M. Levy

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The genesis of a construction project

The design and construction industry represents a huge chunk of the American economy. There are 2.53 million construction companies in the United States, and the total value of construction in place in 2007 was \$1.137 trillion. Of this total, about \$499 billion was residential housing and \$637 billion was nonresidential construction: commercial buildings, schools, factories, roads, and bridges. Architectural and related engineering services included 107,386 establishments employing 1,266 million people and generating revenue of \$161 billion.

ARCHITECTURAL INDUSTRY SNAPSHOT

The practice of architecture is centuries old, but in this country the profession did not become recognized until the mid-1800s as the Industrial Revolution unfolded. Before that time, and in the decades that followed, carpenters and masons not only built structures for their clients but served as quasi-designers as well. The era of the Master Builder flourished in the early twentieth century; skilled contractors employing crews of laborers, carpenters, bricklayers, plumbers, and other trades offered clients the benefit of not only their construction experience but their ability to customize past projects to fit the new owner's requirements.

The American Institute of Architects (AIA) was founded in 1857; at that time, anyone could claim to be an architect. The AIA was responsible for establishing schools of architecture—the first at the Massachusetts Institute of Technology in Cambridge, Massachusetts, in 1865. The first graduate from an architectural program was Nathan C. Ricker, who graduated from the University of Illinois architecture program in 1873. This school also had the distinction of conferring the first architect's degree on a woman.

One of the driving forces behind the use of an architect was the proliferation of government regulations and the resultant increase in the complexity of building structures and the types of equipment being offered by various manufacturers. The legal system also began to weigh in on liability issues and to pursue the principle of due diligence with respect to the adequacy of a structure's design.

The practice of architecture has changed dramatically since those early days. Seventy-five years ago, a visit to an architect's office would reveal rows of aspiring architects hunched over their drawing boards preparing hand-drawn designs, erasers at hand, moving T-squares and plastic triangles to form the shape of their structure. Today, the pens and pencils, T-squares, triangles, and erasers have been replaced by powerful computers and specialized software programs. The only noise emanating from those work stations are the mouse clicks and printers from which these intricate designs flow.

Increasingly advanced software allows an architect to produce a complete list of all of the materials required for the project simultaneously with the progression of the design itself. If you design a 30-foot-long, 10-foot-high drywall partition, the computer automatically generates a materials list: 15 × 10 steel studs and 14 sheets of gypsum drywall. If the architect has a database of costs, an estimate for both labor and materials will also be created.

Architects using other types of computer software can produce three-dimensional images to be viewed by their engineers and clients. By adding a time sequence—the fourth dimension—the client can actually see the virtual building being constructed from the ground up before the first shovel of earth is uncovered. This innovation, called building information modeling (BIM), which is now offered by large architectural firms, will undoubtedly become mainstream, and new innovations will continue to amaze potential clients.

THE ARCHITECT AND THE CLIENT

The Architect's Handbook of Professional Practice defines the term *client* as “at least one person with whom one architect will deal with on what is most often a remarkably intimate basis.” There is an intimacy between owner and architect similar to that of contractor and owner, as these professionals consume so much of the owner's time and money to produce a product with a potential 100-year lifespan. The structure that results will either please or displease its owner-occupant for years to come, so it had better be done right. The owner places those responsibilities on the architect and the builder.

In the *Architect's Handbook*, Gordon Chong states, “Unlike architects, who view the design and construction of a building as ‘an end,’ the majority of our clients see buildings as ‘a means’ to satisfying a wider set of requirements.... One of the most important challenges facing us as architects is to ensure that we fully understand our clients and their motivations.”

THE CONSTRUCTION INDUSTRY

The three basic segments of the construction industry are building contractors, also known as general contractors, who construct residential, commercial, industrial,

and institutional buildings; heavy and civil-engineering contractors, who build roads, highways, bridges, tunnels, and other similar projects; and specialty contractors, more familiarly known as subcontractors, who perform specific trade work such as carpentry, roofing, electrical, plumbing, heating-ventilating-air-conditioning (HVAC) work, and a host of other tasks. The 2002 U.S. Census Bureau statistics revealed that the construction industry had a total of 8.9 million wage and salary employees.

Technology in the construction industry has not proceeded at the pace enjoyed by the manufacturing sector. Today there are some robot-driven, software-guided bulldozers, but the full impact of technological advances has not reached down to the average general contractor. Although most contractors have computers with sophisticated scheduling, estimating, and cost-control software programs, they still lay up one brick after another to build a wall and nail studs and sheetrock to construct partitions.

AN OWNER'S MAJOR COMMITMENT

To some businesspeople, their company's new construction project may represent one of the largest corporate investments they will ever make, and it is one in which it is wise to proceed carefully and systematically. The process of design and construction is not that complex for professionals in that field, but it is an environment that requires expanding an owner's knowledge and experience. It requires a well-thought-out plan of what the company hopes to achieve in the design and construction of their new or renovated office building, corporate headquarters, or manufacturing facility.

Lessons learned from problems with operations in the old building and pitfalls to avoid in the new design should be carefully annotated when a new project is being considered. Without a careful plan of what you as an owner wish to achieve, it may be difficult to convey those needs and requirements to an architect whose responsibility it is to convert them into a plan that a builder can follow. But before we get ahead of ourselves, as an owner there are some strategic decisions that you must consider as the plan for the new building begins to take form.

Project delivery

The "project delivery system"—the method by which an owner gets from point A to point B—has several different options. Selecting an architect is usually the first step in this process but not necessarily an absolute. There are several ways to proceed with the design and construction of the project. Each of these project-delivery systems is discussed in much detail in the following chapters in this book, but for now let's look at the basics. The project's genesis can take several forms: design-bid-build, design-build, construction management, and program management.

Design-bid-build

The most prevalent project-delivery system in the public sector, also employed by a large number of private-sector clients, is the design-bid-build process. It is a rather

straightforward approach: An owner engages an architectural or engineering firm to produce a complete set of plans, specifications, and specific project requirements. These documents, referred to as bid documents, are distributed to a selected list of general contractors, who are prequalified as far as construction experience and financial strength is concerned. These contractors will submit their price to complete the work as outlined in the bid documents. It seems like a simple approach, but, as we shall see later, there can be a lot of twists and turns in the process. Since the contractor bidders will be estimating the costs for all of the work stated in the bid documents—the plans and specifications—the quality of the bids will depend on the quality of the plans and specifications. If something is missing from the plans, the bidders may not include that missing item in their price because they are concerned that their competition will not.

Some refer to design-bid-build as design-bid-redesign-rebid. An owner's budget may not reflect the actual cost of the construction project, and upon receiving bids, the lowest bidder may have submitted a price in excess of that budget. The owner must go back to the drawing board to redesign (at additional cost) and rebid, sometimes in a time frame of rapidly increasing costs, with the result that the project requirements may have diminished but the cost of work increased.

In many instances, the bids received by an owner during the conventional design-bid-build process exceed the owner's budget, as just noted. This can occur for one of many reasons. The delay between the completion of the plans and specifications and the date when bids are solicited may be subjected to inflationary forces in the marketplace. Historically, inflation in the construction industry has outpaced the Consumer Price Index (CPI), and a time lag of 12 months, for example, may generate increased labor and material costs of 5 percent or more. Some owners may not have allowed for that adjustment. Alternatively, the owner's budget may have been assembled with unrealistic prices to begin with, and the market will return the more realistic costs.

For whatever reason, when the design-bid-build process results in bids that exceed the owner's budget, an architect and owner may decide to work with the lowest qualified bidder, review costs, and make changes that are acceptable to all parties to reduce the price of the work to fit the owner's budget. This may require some design changes, and an owner and his or her design consultants must carefully consider all of those costs and also ascertain that neither the program nor the quality will be impacted by the changes. The negotiated scope of work and resultant price can then be incorporated into the negotiated construction contract.

Another approach to a negotiated contract is to select a general contractor with whom the owner and/or architect has had previous successful dealings and ask that builder to work with the architect to develop a cost-effective design that meets the owner's program. In this process, the contractor can share current estimating experience with the architect and advise on constructability issues, material and labor costs, and availability. The architect can then review these comments and incorporate the accepted changes in the design, and the owner can negotiate a contract agreement with the general contractor.

Design-build

Engaging an architect at the conceptual stage of a project is not the only way to proceed down the path to design and construction. An increasingly popular process called design-build is being employed in both private- and public-sector work. The essence of design-build is to place both activities in the hands of one firm: a design-builder. Some design-build firms were created when a general contractor employed architects and/or engineers on staff to provide a full-service organization. Other general contractors offering design-build services form a joint venture with an architectural firm or hire an architect much as they hire subcontractors to perform the design work.

Architects can also be the lead team member in a design-build situation, inviting a contractor with whom they have worked successfully on previous projects to join with them. This process of placing design and construction in the hands of one entity has the advantage of being able to monitor real-time costs as the design progresses to keep the owner's budget on track. The contractor employs the current database of costs in parallel with the progression of design so if changes need to be made to remain on budget, these changes can be reviewed quickly by the owner, who may elect other cost-saving options or increase their budget. At least there are fewer surprises.

According to advocates of design-build, the entire schedule for the project is significantly shortened because the "build" side of the team can begin to order materials and equipment, engage subcontractors more quickly, and get a jump on construction. A reduced schedule means less construction financing, which is more expensive than permanent financing. Owners using design-build report fewer change orders—another plus to this project-delivery system.

But design-build is not for everyone; it requires an owner to have a specific detailed plan in place and experienced staff on hand to manage the process from the owner's standpoint; in some instances, state laws do not permit design-build projects. There are a number of firms that specialize in design-build support, and the Design Build Association of America (DBIA) is a source for more information and a list of design-build firms.

The construction management approach

The Construction Management Association of America (CMAA) considers construction management a *service* as opposed to the hiring of a contractor who delivers a *product*: the building designed by the architect. But the construction-management approach is also a project-delivery system. Unlike the arm's-length contract transaction between an owner and a general contractor in a design-bid-build or design-build system, the construction manager (CM) is the owner's agent and acts, as such, on his or her behalf.

The construction manager provides the owner with sufficient professional office and field staff to complete the construction project. These services can be provided during the design stage, the construction stage, or both. Construction management can be viewed in much the same way as a situation in which an owner has experienced construction professionals on staff to handle the upcoming construction project.

As an owner's agent, the CM will serve as a representative of the owner when engaged to assist in the design, the construction, or both, stages of the project. Some consider the hiring of a CM during the design stage to be most important because this is where these professionals can bring their knowledge of costs and means and methods of construction to bear as they work with the designers to produce the most cost-effective project.

CM services are divided into two basic phases: design and construction. An owner employing a CM during design is able to tap that professional's knowledge of local labor pools, material and equipment vendors, and a current estimating database and then advise on scheduling and value-engineering procedures. A CM during construction will provide the owner with a seasoned project manager, project superintendent, and other professional staff to meet the owner's needs and interests throughout the project. A list of CM firms is available through the Construction Management Association of America website: www.cmaanet.org.

The program manager

Taking the role of construction manager a little further, a program manager's responsibilities are wider and more varied. The CMAA defines the role of program manager as one that includes not only assistance in the design and construction process but also development, planning, environmental study, and interaction with local, state, and federal government regulatory agencies. The program manager can also be engaged to oversee multiple owner projects, each of which may be in various stages of development.

The construction consultant

If an owner does not have experienced staff in either discipline, another approach to design and construction is possible. In this case, an owner can hire a consultant to represent him or her. These consulting firms have experience in all phases of the construction process and can be hired for specific phases. They can work with the architect during design development to comment on costs versus design, and they can work with the owner during the bidding process to interview prospective bidders. These consultants will review bids, offer advice on contractor selection, and work with the owner's attorney during the preparation of the contract for construction to ensure that ample protection is included in that contract. The consultant can be engaged to review change orders and assist in resolving disputes and claims from the contractor. These consultants generally work on an hourly rate and are available on an as-needed basis.

There are a number of different types of consultants that an owner may consider as he or she begins to firm up the project plans. Estimating consultants can provide cost information of a general or detailed nature. This could prove helpful in the project's planning stage to establish a budget and determine whether available financing sources are adequate.

Cost manuals, such as those published by R.S. Means or McGraw-Hill's Sweets Division, provide component, unit-cost, and square-foot pricing for many different types of construction and can be ordered over the Internet.