

# 1

## EVOLUTION OF THE CONSTRUCTION PROJECT

### OVERVIEW

To better understand the working drawings and specifications, you need to have some understanding of the process that most construction projects go through from conception to completion. In this unit, we will look at the project team members and their responsibilities, and explore the sequential steps of a project through four phases: conception, promotion, design, and construction. As we explore these phases of construction, we will be referencing Figure 1.1. This graphical representation of the phases will allow us to tie together the project tasks, team members, and contract documents developed and used on most construction projects.

### THE CONSTRUCTION PHASES

The construction of a building project goes through four distinct phases. Each phase results in the involvement of many different organizations contributing information to the building projects design. These phases and organizations ensure all of the necessary elements are addressed before completion of the project, and it is important that we understand them.

#### The Conception Phase

The start of the project comes when the owner decides a new building is needed. This decision is made in response to many possible factors. Perhaps the owner decides more manufacturing space is needed, more storage, or more warehouse space. The owner might decide he needs additional seating

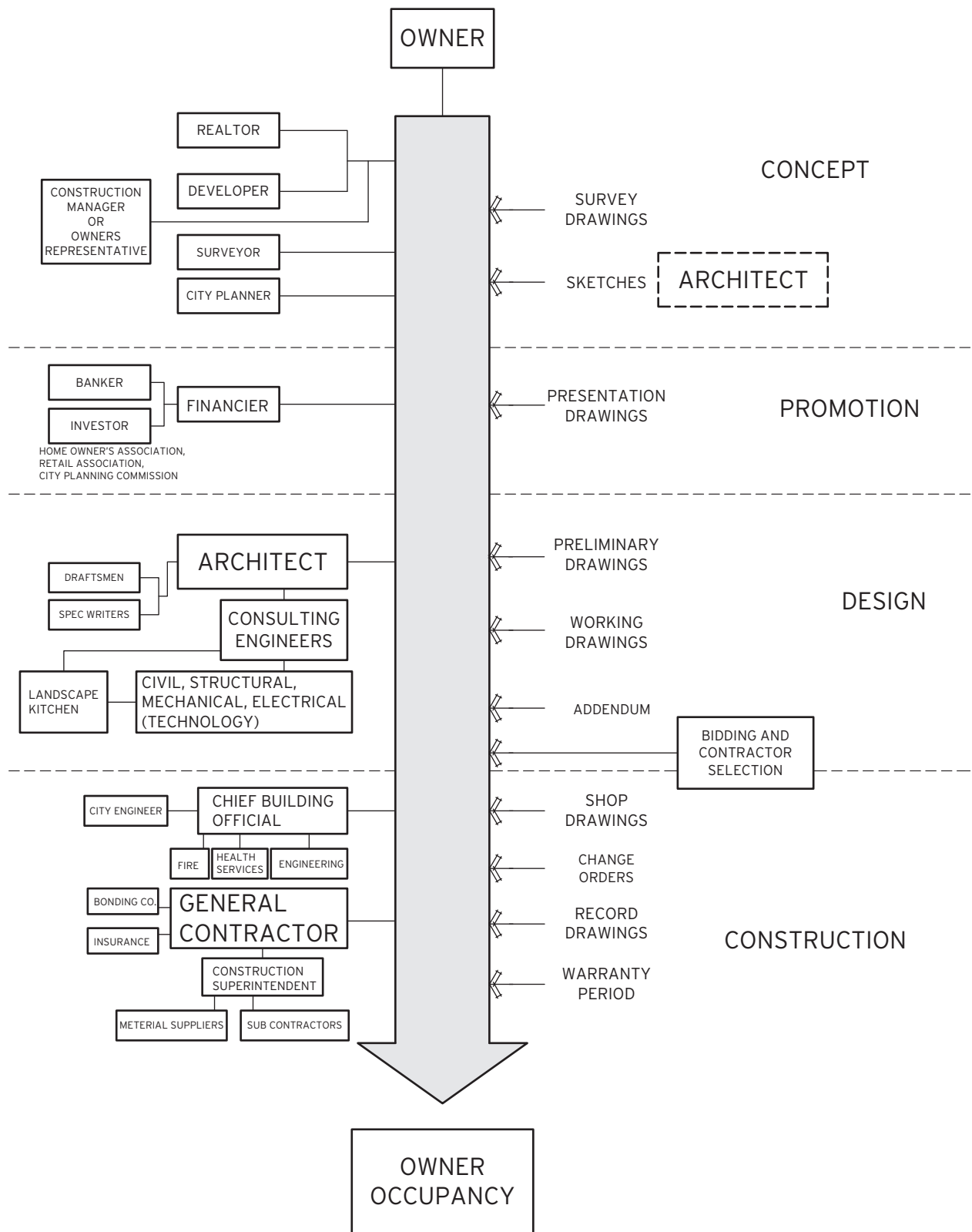


FIGURE 1.1 Four Phases of Construction

capacity to entice more customers to visit an establishment. Perhaps he just wants to have an updated facility or building that conveys the new image of the company. Whatever the reasons that motivate the owner, they result in the need for construction. The owner is the driver for the entire process since he has the design and the money to accomplish the project.

Depending on the owner and the business, he may or might not be very familiar with the construction process. If the owner constructs a lot of buildings each year, such as in retail or chain restaurants, he may be very familiar with the process and how to manage it. If he only builds every 10 to 20 years and building is not part of his business plan, he may be quite unfamiliar with the construction process. If the owner is not familiar with the process, it is probable at this point in the process that he or she would enlist the services of a construction manager. This individual would be well versed in the construction process and would advise and assist the owner through all phases of process. He would, in some cases, act as the agent for the owner and make commitments that bind the owner. In these cases, the construction manager could be called the owner's representative. If the owner builds a significant number of buildings each year, it is probable that there is someone on staff who will manage the process for the owner. In fact, if he builds many buildings each year, the owner might have a complete real estate and construction staff.

Once the owner has decided to build, he must then decide where to build. It may be that he already has property, especially if he has a campus-style setting for his company's operations. Or, he may simply possess property that he intends to use. If not, he would begin the search for property that would fit the business need or that would enhance the building's function. Most likely, the owner would begin the search by contacting a developer or a Realtor. This individual would direct him to the available properties that would most likely satisfy his business requirements.

A developer would be likely to show the owner properties that are undeveloped, lacking roads, utilities, and other amenities, but that would fit the owner's requirements and allow the flexibility to fully customize the site and building. The developer would generally offer up the property and agree to install the necessary roads and utilities to fit the owner's project requirements. These improvements would typically be developed as the architect and engineers develop the construction project. The advantages to this approach are that the owner has a site that fits his or her requirements exactly when completed, including all traffic requirements and with all utility requirements sized correctly for the finished project or building.

A Realtor, by contrast, would introduce the owner to properties that are already developed with roads or driveways and parking, all utilities available at least at the property line, and perhaps even an existing building that could satisfy the owner's requirements. The other significant difference between a developer and a real estate agent is that the developer is working with properties that he or she typically owns, whereas a real estate agent is showing properties that are owned by someone else.

Once the owner has selected a property for his project, he would want to make sure that the boundaries are defined and filed with the local municipality or county to ensure there is no confusion on where work can be done on the property. Most municipalities have set-back rules that

govern how close a building or structure can be to adjacent property lines. The owner would also want to know where all easements are located for the municipality or utility companies. To accomplish the recording of the boundaries, a surveyor will be hired to come in and develop drawings and a written description of the property. (See Figure 1.2.)

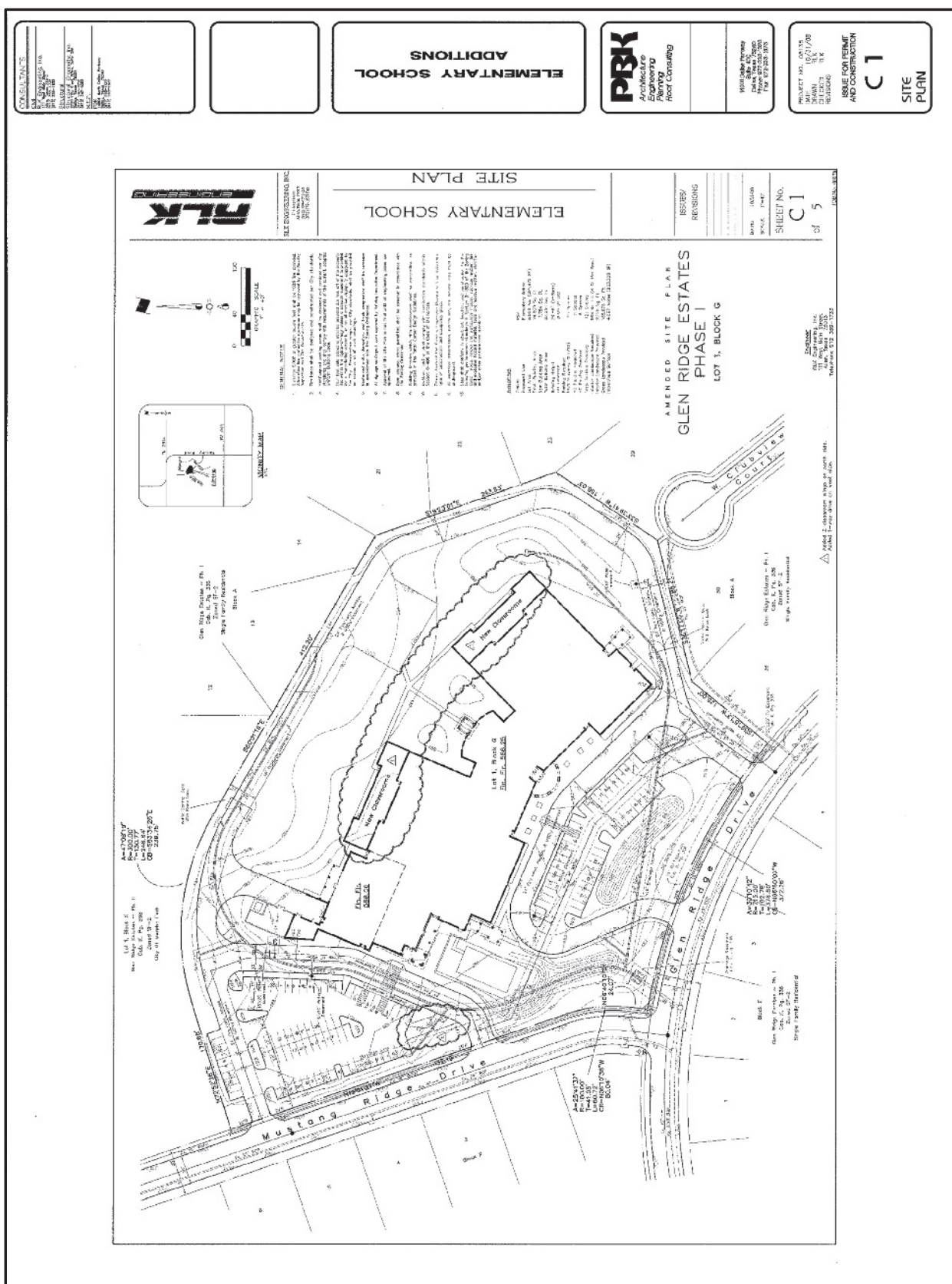
A surveyor will measure the distances around each boundary of the property, using sighting equipment, and document the information, using a metes and bounds system. He or she will note exact locations of corners, directions of turning points, and changes in elevation as necessary. The surveyor will document these dimensions by developing the survey drawings and a written description. These documents will be filed with the city or county the property resides in and will be recorded on the plat drawings for that municipality.

Simultaneously, the owner should be starting conversations with the appropriate city planners to determine if the property can be zoned for the type of activity the owner is going to use the property for, if it is not already so zoned. This is especially important for undeveloped properties because zoning may not have been established for the area yet and the process for obtaining zoning could be time consuming. Most properties shown by a Realtor would already be zoned and, if not zoned for the owner's specific activities, appropriate zoning must be obtained. The city planners can give the owner some idea of the amount of time and work that could be involved in this process.

Recognizing that the city planners will need some idea of the project to establish zoning requirements, the owner must now select an architect to develop the drawings and specifications. The architect will begin to be more heavily involved with the owner to start defining the project for which he or she has the primary responsibility for the design and development of the contract documents.

At this point, only the owner has any vision of what the project will look like. The architect must extract this vision from the owner and begin committing the vision to paper so others can observe the project as well. To do this, the architect will begin a series of meetings with the owner. The first meeting will be to gather basic data on the owner's needs, what type of business the owner will be conducting, how many people will occupy the building, how much raw material is needed at any given time, and so on. The architect will want to understand the owner's intended workflow and processes, or any people flow requirements that are required to satisfy the business intent. Next, the architect will begin to ask the owner questions about the vision of the project: How does it fit on the property? Which direction does the building entrance face? How many room should the first floor have? and so on. With the data gathered at this first meeting, the architect can begin developing sketches based on an understanding of what the owner wants. This called the SD phase, or sketch development phase, by the architect.

At this point, the architect will focus on perhaps a basic floor plan, general site layout, and front elevation view of the proposed building. These sketches should reflect the comments of the owner on product or people



flow, building appearance, and projects intended use. Once the architect has these first sketches developed, he or she will return to the owner and review them to validate the architect's understanding of the owner's vision.

The owner now has something to look at and can confirm for the architect that the sketches reflect his vision. Also, the owner can now see the project and apply changes. The architect might say, "Based on our last conversation, I have developed these sketches of how I envision your project." The owner would reply, "Yes this is what I want here and here; however, now that I see your sketch, I think this should really be over here." This type of exchange could continue for weeks or longer, if needed, until the architect is convinced that the same vision is shared by him and the owner.

During these exchanges, the architect would be providing guidance on things that are or are not feasible for construction. The architect would also provide insight on costs for certain elements and would guide the owner on design decisions that might be affected by codes and laws. The owner would finally reach a confirmation point: "Yes, that is exactly what I want." Then, the architect would begin developing what are called *presentation drawings* and the project would move into the promotional phase.

### Promotional Phase

At this phase, many interested parties will need to understand the impact of the project, for many various reasons. The object of presentation is to get buy-in from the interested parties using the various forms of drawings.

Presentation drawings consist of several different types of drawings that will allow others to clearly see the project as defined by the owner and make decisions about how they would act on the project. The presentation drawings are designed to show the project as it will probably appear when completed. There are typically three types of these drawings: floor plans, pictorial representations, and models. You have probably seen examples of these yourself.

Floor plans are used a lot when an existing building is being expanded or remodeled. This type of drawing would be posted at the entrance of the building to allow the occupants and visitors to see how interior configuration changes will affect them and the work they do. Pictorial representations, as shown in Figure 1.3, and models, shown in Figure 1.4, are used

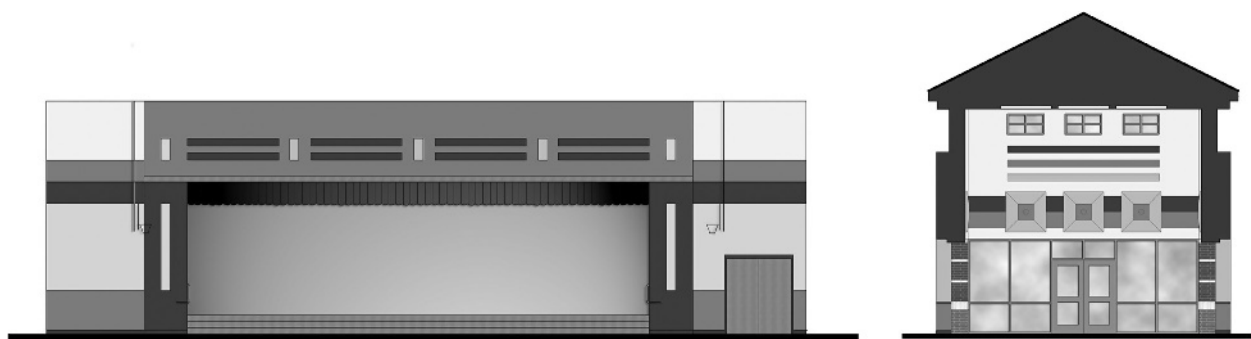


FIGURE 1.3 Presentation Drawings



**FIGURE 1.4 Architectural Model**

primarily for new construction projects to allow interested parties to visualize the completed project. Pictorial representations are typically drawn using a perspective drafting technique and are usually colored or painted to add realism.

Models are a type of pictorial drawing that offer a three-dimensional view of the project made to scale. You may have been in lobbies of some buildings and seen a picture of the building on the wall or a glass-enclosed three-dimensional model on display. These drawings and models are often displayed after completion of the project when *interested parties* no longer need to be swayed for support. Interested parties could include financiers such as bankers or investors, city planners or engineers, homeowners associations, retail shopping centers, or mall associations.

When an owner decides to build, he or she might choose to finance the project, even if the funds are available for the construction. There are many different types of financiers, but two are most typical. *Bankers* are lenders that intend to make money on the interest charged the owner for the use of the money. They would be interested in seeing the presentation drawings to determine if the owner's project will suit his intended use and would be a viable asset over the life of the loan. *Investors*, by contrast, will lend money on the project in anticipation of getting a return on their investment from the valuation of the project over an extended period of time, either from the operations conducted at the site or from the building's use through leases.

As mentioned previously, city planners are interested in the project for zoning, business area planning, and code compliance standpoints. They are chartered by the municipal government to ensure that all applicable building codes are complied with by all new and renovation construction projects and the places are safe for the general public to conduct business. They are also concerned with assisting the municipality with planning business areas so that a certain compatibility exists between surrounding businesses and residential areas. This often involves modifying zoning requirements for particular pieces of property. If you are looking at zoning around a residential area, you should be prepared to show your presentation drawings to homeowners associations.

Homeowners associations are interested in preserving the quality of life that their areas represent. They are typically chartered by the neighborhood in their area to monitor anything that has the potential to change that quality of life and bring it to the attention of all the members of the association. As a group, they would be interested in how a new project will affect home and property values, if it will fit in with the neighborhood's appearance, if it will bring services that the community needs, if it will have an adverse affect on traffic, and so on. They will tend to scrutinize every aspect of the project, including exterior colors, to ensure that their property values and quality of life are not degraded.

Much of the same is true of retail shopping center and mall associations, only from a business perspective. These interested parties have committed their livelihood to a certain location and will be very concerned that any new project might jeopardize their business by not meeting the standards established by the retail center.

Many interested parties will be looking at the proposals made for the project. The owner and architect will be required to work together closely to satisfactorily allay concerns over the project. Clear and descriptive presentation drawings go a long way toward accomplishing this, because many people have difficulty in visualizing a project without a representation of it. One picture could indeed be worth a thousand words in these situations.

## **Design Phase**

Once the promotional phase is significantly passed, the architect and his engineers begin in earnest on the DD phase, or design development phase. In this phase, the architect has provided the primary consulting engineers with the basic premise of the design, and they begin to work on the project's preliminary drawings.

The preliminary drawings are drawings created by the architect and engineers to solve problems. These drawings will be used to make sure that the design intent for the building can be met. For example, they will be used to solve problems in areas where dissimilar materials come together, or where unique building shapes require unique structural members. All problem areas will be explored and some type of solution developed before progressing on the project.



The architect's primary consulting engineers for electrical, mechanical, and structural issues will work with the architect to solve each respective discipline's problems. The electrical consulting engineer will work to solve any special lighting issues, power distribution issues, or dedicated electrical service issues and will provide the solutions to the architect in drawing form, as well as with the appropriate specifications for the electrical engineer's portion of the design. The mechanical consulting engineer will develop solutions for HVAC distribution to balance the building environment and ensure that systems such as supply water and fire protection can be completed as required by code. The structural engineer's specification writers will make sure that the building design can be supported structurally and will withstand the loads anticipated during the conducting of business in the building and from the outside environment. Once the preliminary drawings are completed, the consulting engineers will provide them to the architect for review. If at any time during the development of these drawings a problem cannot be solved, then the architect must alter the design so that the project can be accomplished. This may necessitate going farther back to the earlier phases of the project with the owner and interested parties if the design must be significantly changed. Once all issues have been resolved, the architect and consulting engineers can begin developing the drawings that we are most interested in, the working drawings. The architect will call this the CD phase, or contract document phase, which the working drawings will become.

The working drawings are the drawings that we typically bid from and build from, hence the term *working* drawings. Once these documents are completed, they are made available to contractors for bidding—either through a plan room where they are checked out and reviewed or by direct issue, where the contractors all pay a deposit to the architect for their own copy. At the same time, the specifications are issued so the interested parties have a complete picture of the project to bid on. The specifications have the invitation to the bidders, instructions for the bidders, and the bid forms to be used for that project. During the bidding process, questions may arise from the bidders and other interested parties that require information in the working drawings and specifications to be changed. These changes will be issued in the form of an addendum, which modifies the working drawings and specifications by adding information to or by deleting information from these documents. Addenda will be issued to all interested parties who have solicited drawings from the architect and to all plan rooms where drawings and specifications have been submitted. The addenda will only be issued up to about two to three days before the bids are due. This date will be announced in the bidding instructions. Once the bids are submitted, no more addenda will be issued or modifications to the working drawings and specifications made.

## Construction Phase

Once bids are received and opened, usually the lowest qualified bidder is selected. The qualifications required for bidders on each project can vary. Once selected, the lowest qualified bidder will become the general contractor for the project. After contract documents are signed, the general

contractor will go to the city offices and obtain a building permit. This will set up the city building inspectors to develop an inspection schedule for the contractor for the various stages of the work, which will have to be approved before work on each subsequent stage of the project can continue. Typically, the city inspectors will include the plumbing inspector, electrical inspector, structural and fire protection inspectors, and possibly the city engineers, as needed. These inspections should go smoothly since the city will have been involved early in the project and will have seen the various drawings created at each stage: presentation, preliminary, and working.

The general contractor is responsible for providing all labor, materials, and equipment to complete the project as defined by the working drawings and specifications. To provide the materials, the general contractor will work with suppliers' and manufacturers' representatives, using the specifications to obtain exactly the materials specified by the owner and the architect.

Because most general contractors do not keep all the crafts and skilled labor on staff to complete an entire project, they will use subcontractors with their own workers to provide the labor for the project. Most subcontractors tend to be specialized in one particular aspect of construction and have the necessary specialized equipment for completing that part of a project. Subcontractors are sometimes also responsible for providing drawings of the work they are going to do. These are called *shop drawings*.

Shop drawings are created by a contractor or subcontractor that show details of the work that they are going to complete for the project. These drawings are typical of elements of the building that will be fabricated in the contractor's or subcontractor's shop—thus the name *shop drawings*—and brought to the job site and put in place. These drawings must be submitted to the general contractor who, in turn, submits them to the owner, or architect if the designated recipient, who reviews them for compliance to the working drawings and specifications, approves them if acceptable, and returns them to the general contractor, who gives them back to the subcontractor to begin work. Work on these elements of the building should not be started until the shop drawings are approved. All work done by the subcontractor must be completed as indicated on the shop drawings.

During the construction phase, things might appear that trigger a change in the scope of work defined in the working drawings and specifications. Perhaps something is uncovered that was not seen before or anticipated. Sometimes during the course of construction, a design simplification becomes evident. Sometimes, an error is found that will not allow the project to proceed as intended. Any of these events will require that the architect and consulting engineers devise a solution to the new problem. If this solution necessitates changing the scope of work and modifies the working drawings and specifications, a change order may be issued.

Change orders modify the contract for construction, and possibly the contract amount, by adding information to the working drawings and specifications, or by deleting information from the working drawings and specifications, thereby modifying the scope of work. This is very much

like the effect of an addendum; however, it is much more significant because we are now modifying a scope of work that has a contract associated with it for a specified amount of money for that scope of work.

As these changes arise during the construction process, they must be recorded. This is typically done on a copy of the working drawings kept in the job superintendent's office at the job site. When a change is encountered due to a change order or for some other reason, the modifications showing how the construction was actually done are marked in red pencil or ink on the drawings and in the specifications. These marked-up drawings become the basis for the *record drawings*. Once the project is completed, the marked-up drawings are submitted to the architect.

The record drawings, or *as-builts*, as they are commonly called, document for the owner and contractor exactly how the project was built and where elements of the building were located. The architect modifies the original working drawings and specifications to provide a record of how the project was actually built so the owner will be able to use the documents for maintenance, repairs, and modifications to the building in the future.

The contractor is interested in these record drawings for another reason. Most general contractors will provide the owner with at least a year's warranty on the labor and materials provided, including workmanship. In some cases, contractors have begun to use the warranty as a competitive advantage by offering extended warranties, up to five years. It is then important that the contractor have a record of exactly how the project was completed in order to effectively manage that process. At the end of the warranty term, the project can then be considered completed.

We have now looked at the four phases of the construction process, noted some of the individuals involved with the project, and learned where each of the different categories of drawings fit into the process. Next we will look at the relationship of some of the main construction team players and explore in more detail their responsibilities.

## THE CONSTRUCTION PROJECT TEAM MEMBERS

There are three primary members on the traditional construction team: the owner, architect, and general contractor. Each of these team members has various individuals or groups of individuals that support them in the delivery of their part of the project. They all have specific roles and responsibilities to each other. Although there are other individuals that might be on a project team, we need to understand the primary members first.

### The Owner

Since the construction process begins with the owner's identification of its need for a facility, we will start with learning the owner's role in the construction process. Without the need for a building, we would not do construction and the owner would be saving money. But since the owner is spending his money, he plays some critical roles. Also, the role of spending money does not alleviate the owner's responsibilities to the other

team members. It is probably appropriate to point out that even though we are saying *owner*, it is possible that the actual team member carrying out the duties could actually be a construction manager or an owner's representative.

The owner obviously has responsibility for paying the other team members for services rendered. The architect is paid upon completion of various design stages, and the general contractor through pay applications that are submitted monthly, or on some other agreed-on frequency. The pay applications indicate a certain amount of completed construction work or materials for the project that are staged on the site. Once the owner has verified the accuracy of the contractor's pay application, sometimes with the help of the architect, the owner has a specific agreed-upon time frame in which to furnish payment to the contractor.

During the design and construction phases of the project, the owner will have the responsibility for providing information to the architect and general contractor within specified periods of time to ensure that the project remains on schedule and that no one incurs unnecessary expenses due to delays. These duties will be outlined in the contractual documents signed by these parties and discussed in the next chapter.

The owner also must provide the construction site without encumbrances so the work can be accomplished. The general contractor must be able to utilize the site effectively to allow safe and cost-effective construction, within certain physical limitations such as right-of-ways, easements, and property boundaries. The owner is also responsible for providing the description of the project through the drawings and specifications, even though these are created by another team member, the architect.

## **The Architect**

The architect's primary function is to develop the definition of the project and provide the final construction documents, the working drawings and specifications. We have talked at length about the conceptual, promotional, and design phases of the construction process, and this is where the primary responsibilities of the architect are. The architect will assist the owner in developing the concept, refining it, presenting it to the interested parties, and developing the final construction documents. The architect is usually the primary individual who works through the first phases. Once the project moves into the design phase, the architect will enlist the aid of other members of the team to complete the working drawings and specifications.

To complete these contract documents, the architect will typically enlist the services of structural, mechanical, and electrical consulting engineers. Usually, unless the architect has a very large firm, these disciplines will not be on staff. Instead, because requirements vary from project to project, these individuals are kept on retainer to assist as needed on each project. These engineers will complete their portion of the project design based on information received from the architect for assimilation into the working drawings. These engineers will also be responsible for developing the portions of the specifications applicable to their design. The architect has

the overall responsibility for the integrity of the finished working drawings and specifications.

We have noted that the owner or the owner's representative will exercise the owner's duties. On some projects, the architect will assume the owner's representative's duties at the owner's direction and as stipulated in their agreements. This arrangement is why it sometimes appears that the architect is the main operative in the team, when, in fact, the owner is always the primary member coordinating the architect and general contractor's efforts.

## **The General Contractor**

The general contractor is responsible for completing the project as defined in the working drawings and specifications and for developing the means and methods for accomplishing the work, scheduling the work, and providing all labor, materials, equipment, and supervision necessary to complete the project.

Much like the architect, the general contractor has many varying projects and requirements. As a result, the general contractor will not always keep skilled labor or specialty equipment on hand. Instead, he will utilize subcontractors who have the skilled labor and equipment needed to complete certain portions of the project. The advantages of this for the general contractor are as follows:

- It reduces overhead by not having a significantly large number of pieces of equipment and skilled labor on hand that would not be fully utilized.
- The use of subcontractors ensures that skilled craftsmen are on the project.
- Since most subcontractors specialize in their fields of construction, they have the proper equipment to do their work.

For example, if all you do is electrical work, then it makes sense to have skilled and licensed electricians and the electrical construction equipment needed for most jobs. However, the general contractor could not cost-effectively provide this unless it were a large firm that continually utilized these in daily business on projects.

Since the general contractor is responsible for furnishing all materials, the general contractor will have rapport with various suppliers of construction materials. Depending on how often and how much of these materials are purchased from a particular vendor, the general contractor could have a competitive advantage over another contractor in supplying materials, as long as the materials provided comply with what is defined in the specifications.

The general contractor also has the responsibility for providing information in a timely manner to the owner regarding schedule progress, completed work, and any other issues that affect the project.

The team relationship between the owner, architect and general contractor is just that—a *team* relationship. The owner needs the project for his

or her business. The architect wants to complete the project for payment of services. The general contractor wants to complete the project for payment of services. Each member of the team has a vested interest in the same objective—completing the project. Even so, the owner is the customer, and the team relationship reflects this.

## THE CONSTRUCTION TEAM RELATIONSHIPS

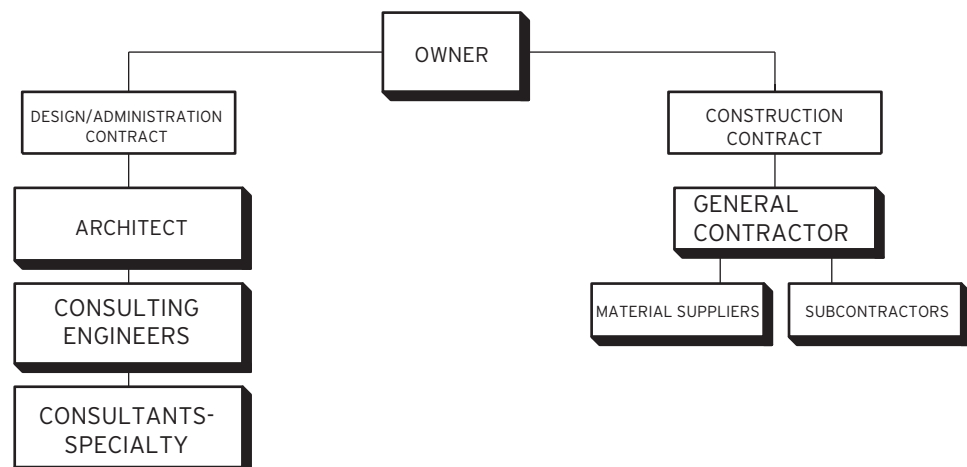
To look at the construction team relationships, we will really be discussing the different types of construction contract delivery methods. There are primarily three methods to explore: the traditional, construction management, and design-build delivery methods.

### The Traditional Method

The traditional method is the oldest and most commonly used of construction delivery methods. Shown in Figure 1.5, this type of team structure has the basic owner/architect/general contractor relationships and the services provided are as we have discussed previously.

The owner provides the money and the site for the project and has an agreement with the architect for providing the design, working drawings, and specifications. The general contractor has an agreement with the owner to provide the labor, materials, equipment, and expertise to complete the project per the working drawings and specifications. These agreements are specific written contracts that exist between the parties and will be discussed more in the next chapter. It is important to note that there is not a contractual agreement between the architect and general contractor. These individuals work exclusively at the discretion of the owner, based on their contracts with him, to complete the project.

If you will notice in the example, those individuals who support the architect and general contractor are not considered primary team members. There are no contractual agreements between these individuals and the owner. The structural, mechanical, and electrical consulting engineers



**FIGURE 1.5 Traditional System**

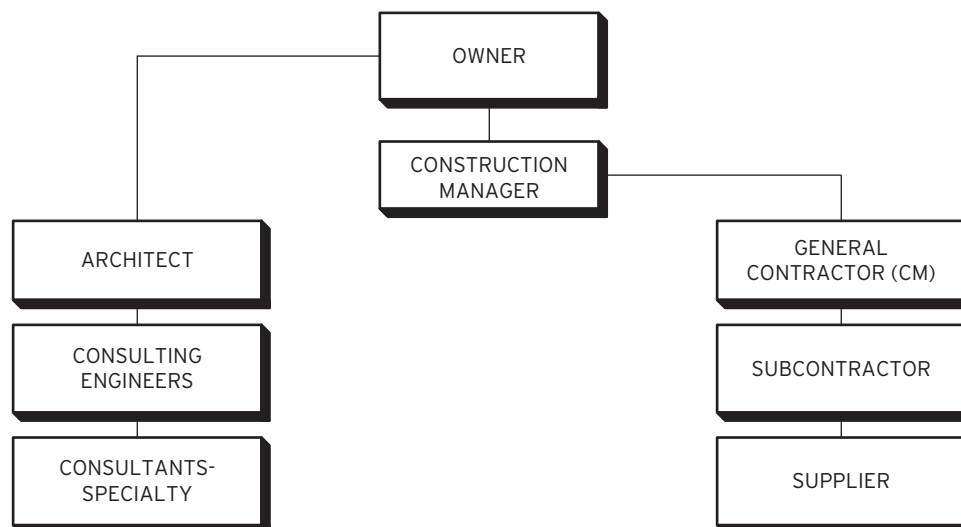
work exclusively for the architect and have no relationship to the owner or general contractor. The subcontractors and suppliers work exclusively for the general contractor and have no relationship to the owner or architect. This traditional team structure also typifies the information flow. Again, each team member has the same goal—complete the project.

### The Construction Management Method

As discussed previously, there are many construction projects where the owner has no construction expertise, does not have the time to manage a construction project, or does so much construction that it makes sense to not simply have an owner's representative or architect perform those duties, but requires an entirely separate firm to be hired just to manage the project(s). This is also sometimes done when a project is very complex. The construction management firm will assume the roles of the owner and act as his or her agent to make decisions in directing the architect and general contractor to complete the construction project, as depicted in Figure 1.6.

The owner will hire the construction management firm, and it will make all the agreements with the architect for development of the construction documents to satisfy the owner's needs and then will manage the bidding and construction process to complete the project. Essentially, the other team members will operate with the construction management firm to complete the project.

There are two primary construction management delivery systems, agency and at-risk. The agency construction manager works for a fixed fee with the owner and acts only as the owner's agent and manages the architect and general contractor. The agreements between the owner and architect and general contractor remain the same as in the traditional method. The agent has no responsibilities for the design integrity or construction methods or techniques. The owner pays the agency construction manager on a fee basis.



**FIGURE 1.6 Construction Management Delivery System**

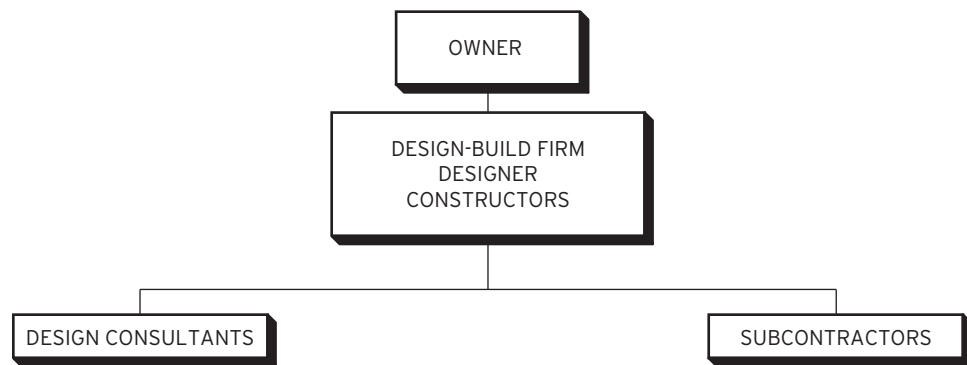


FIGURE 1.7 Design-Build System

The construction-manager-at-risk has similar responsibilities, except for being involved in the conception and design phases of the project, and manages the project as though he or she were the general contractor. The owner has little day-to-day involvement, and the general contractor is in a role similar to that of a subcontractor. The construction-manager-at-risk provides the owner with a maximum price for the project and manages the project so that the costs allow for completion of the project, with some profit left over for the manager-at-risk's organization—hence, the *at-risk* title. If the project is not managed well, costs will rise and possibly exceed the maximum price, and the construction manager will lose money.

### Design-Build Method

This method is becoming more popular with owners, since it is a single-source project delivery method where all the necessary services are provided by one organization. Design and construction, even site selection and purchasing options, are provided to the owner. A single design-build organization will be responsible for providing the functions required to develop the design and the final working drawings and specifications, and for actually providing the construction of the project, usually with its own labor, although some of the project could be subcontracted to others. For the owner, there is a guaranteed maximum price. Figure 1.7 shows the relationship of the design-build firm to the owner.

## SUMMARY

In this chapter, we discussed the four different phases of a commercial construction project: conception, promotion, design, and construction. We also discussed the individuals involved in the phases and their roles. We reviewed the responsibilities of the construction team members, owner, architect, and general contractor, and examined the project delivery methods that can be used to complete the project.

All of the relationships, project tasks, and construction methods mentioned here require a significant amount of organization and documentation. As a result, there are many documents that form the agreements for construction. No single document is inclusive of everything necessary to complete



a construction project. In Chapter 2, we will explore some of the contract documents necessary to describe the agreements and manage the work.

### ■ CHAPTER 1 LEARNING OUTCOMES

- The four project phases are: conception, promotion, design, and construction.
- The seven types of drawings created during the project phases are: survey drawings, sketches, presentation drawings, preliminary drawings, working drawings, shop drawings, and record drawings or as-builts.
- The three construction contract delivery systems are: traditional system, construction system (agency and at-risk), and design-build system.

### ■ CHAPTER 1 QUESTIONS

1. How many phases are in the construction process? Describe what the role is for each phase.
2. List the seven types of drawings created during the construction process and what they are used for.
3. Describe the three basic delivery methods used to contract for and construct buildings.

