1 The Working Drawings

Estimating construction projects requires fluency in the language and symbols used in construction plans. This chapter provides an overview of a project's working drawings and plans. It does not offer detailed instruction in plan reading but reviews the organization of the plans and the information necessary for estimating.*

THE ROLE OF THE DRAWINGS

The three terms most often used to refer to the graphic portion of the documents for a building project are:

- Plans
- Drawings
- Blueprints

For the purpose of this text, these terms are synonymous and can be used interchangeably. They are the graphic representation or illustration of the project and comprise the lines, symbols, and abbreviations printed on paper that represent the owner's wishes, as interpreted by the architect. Plans are the quantitative representation of the project. The plans and specifications (*discussed further in Chapter 2*) together make up the contract documents and form the basis of the contract for construction.

DESIGN DEVELOPMENT

Most drawings develop over several generations of review and modification as a result of owner input, coordination with other design disciplines, building code compliance, and general fine-tuning. This process is referred to as *design development,* and it occurs before the release of the final version of drawings, called the *working drawings.* Working drawings are the completed design—a code-compliant representation of the project, ready for bidding and, ultimately, construction. They are the focus of this chapter and are the prerequisite for preparing a detailed unit price estimate. (Note:

**For more than the basic review here, consult* Plan Reading & Material Takeoff, *published by RSMeans.*

"Preliminary" drawings created early in the design development process may be used as a basis for budget estimates, but budget estimating requires specific skills of seasoned professional estimators who have years of experience developing unit price estimates.)

The completed drawings become a "set," which incorporates all adjustments, changes, and refinements made by the architect or engineer as the final step in design development. Working drawings should comply with all applicable building codes, including any local ordinances having jurisdiction. Drawings should include all the information you will need to prepare a detailed estimate and eventually build the project. The set of working drawings consists of various disciplines of design, including the architectural or *core drawings* design, structural engineering to ensure that the structure will support the imposed loads, and mechanical and electrical engineering to make the space habitable and functional.

All buildings are constructed with a definitive purpose and require professionals skilled in specific areas to make the design suitable. Just as most contractors develop an expertise in one market type of construction (residential, light commercial, etc.), design professionals focus on one general area of expertise. A good example is a commercial kitchen designer for restaurant kitchens. Specialty drawings, included as part of the set, often require considerable coordination with the mechanical and electrical systems, as well as with the core drawings.

Other drawings in the set include designs that are less concerned with the structure itself than with support services, such as utilities, that will be provided to the structure. These *civil* or *site drawings* include grading and drainage plans, which indicate how surface precipitation will be channeled away from the structure; landscaping and irrigation design; paving; and curbing layout. Ordinary site improvements, such as fencing, patios, walks, flagpoles, and the like, are shown on a kind of catchall *site improvements drawing*.

Some drawings are crossovers and show items of work or systems that may also be found in another set. For example, site electrical drawings indicating site lighting, power distribution, and low-voltage wiring (cable TV, telephone, and data) may also be shown on the electrical drawings.

ORGANIZATION OF THE WORKING DRAWINGS

There is a distinct organizational structure to the working drawings, which is almost universally accepted and is as follows:

- **Architectural drawings:** Core drawings showing the layout of the building and its use of space. They convey the aesthetic value of the structure and show the dimensions and placement of all key features. The first architectural drawings in a set generally show large areas in less detail. As one progresses through the architectural set, the level of detail increases. These drawings are prefixed by the letter "A" and sequentially numbered.

- **Structural drawings:** Illustrate how the various load-carrying systems will transmit live and dead loads of the structure to the earth. Structural design is based on the architectural features and is designed around the core drawings. (For example, columns and beams are designed to avoid interrupting a space.) Structural drawings are prefixed by the letter "S" and are sequentially numbered.
- **Mechanical drawings:** Illustrate the physical systems of a structure, such as plumbing, fire suppression/protection, and HVAC (heating, ventilating, and air-conditioning) systems. These drawings may be prefixed by the letter "M" for mechanical or "H" for heating. Plumbing drawings use the letter "P," and fire suppression drawings use "FP" (fire protection), "SP" (sprinkler system), or "F" (fire). All drawings are sequentially numbered and shown mainly in plan view.
- **Electrical drawings:** Illustrate the electrical requirements of the project, including power distribution, lighting, and low-voltage specialty wiring, such as for fire alarms, telephone/data, and technology wiring. They often show the provision for power wiring of equipment illustrated on other types of drawings. They are prefixed by the letter "E" and are sequentially numbered.
- **Specialty drawings:** Illustrate the unique requirements of various spaces' special uses (such as kitchens, libraries, retail spaces, and home theater systems). They define the coordination among other building systems, most commonly the mechanical and electrical systems. The drawings are sequentially numbered and named according to the type of drawings. For example, "K" might be used for kitchen drawings, "F" for fixture drawings, and so forth.
- **Site drawings:** Illustrate the structure's relationship to the property, including various engineering improvements to the site, such as the sanitary system, utilities, paving, walks, curbing, and so forth. They are sequentially numbered but have a less formal naming convention, open to the interpretation of the design engineer. They are easily recognized from the core drawings, since they only deal with the site.

Drawings for each of these categories will show only the work of the particular discipline. All lines and symbols that are not specifically related to that discipline are shown in a lighter line weight or grayed-out. This helps coordinate or locate the work of a specific drawing with other drawings that indicate adjacent but unrelated work. Since the overwhelming majority of plans are drawn today on computer, the graying-out of a line or feature is fairly simple and routine.

There are some common, basic elements in a set of contract drawings, which will be discussed in the following sections. These include a cover sheet, title block, revisions, and, to a lesser degree, a code analysis page. (Some revisions will be encountered on every drawing.)

The Cover Sheet

The cover sheet, although very basic in nature, is one of the most important pages in a set of drawings. It lists information, such as the name of the project; the location; and the names of the architects, engineers, owners, and other consultants involved in the design. The cover sheet also lists the drawings that constitute the set in the order they will appear. The drawing list is organized by the number of each drawing and the title of the page on which it appears. The cover sheet may also list information specifically required by the building code having jurisdiction over the design of the project, including the total square-foot area of the structure, the building code use group the structure will fall under, and the type of construction. For larger, more complex projects, the code analysis sheet may be a dedicated sheet at the beginning of the set.

Another important element on the cover sheet is a list of abbreviations or graphic symbols used in the drawing set. There is often a section that contains general notes, such as, “All dimensions shall be verified in the field” or “All dimensions are to face of masonry.” These notes help set the standards for background information that you will encounter throughout the drawings. In the absence of a separate set of bound specifications (most common in the residential market, where separate specs are not often written), the cover sheet may list the general technical specifications that govern the quality of materials used in the work. Optional information, such as a locus plan locating the project with respect to local landmarks or roadways or an architectural rendering of the structure, may be included in the cover sheet.

Many cover sheets define energy conservation compliance calculations or adherence to a specific sustainable standard or program. The reader is advised to review these criteria carefully, as they can have a tremendous impact on project costs.

TITLE BLOCK

The title block is located along the right side, on the bottom, or in the lower right-hand corner of the drawing. Locations can vary by firm. The title block should include the following information:

- The prefixed number of the sheet (so you can identify the discipline and order in which it belongs)
- The name of the drawing (e.g., “First Floor Plan”)
- The date of the drawing
- The initials of the draftsperson
- Any revisions to the final set of drawings

The date and scope of the revisions should be noted within the title block. If there is not enough space available, the revisions should be noted close to it. The title block should specify whether the entire drawing is one scale or whether the scale varies per detail, as in the case of a sheet of details. Sets of drawings for commercial projects, and some residential projects, require a stamp (and usually a signature) of the architect or engineer responsible for the design. This individual is referred to as the "design professional of record."

Revisions

Often, after the set of working drawings has been completed, recommendations are made for correction or clarification of a particular detail, plan, or elevation. While major changes may require redrafting an entire sheet, smaller changes are shown as a revision of the original. All changes must be clearly recognizable. They are indicated with a *revision marker,* which encloses the revised detail within a scalloped line that resembles a cloud. Tied to the revision marker is a triangle that encloses the number of the revision. Revisions are noted in the title block, or close to it, by date and number. This procedure provides a mechanism for identifying the latest version of drawings.

GRAPHIC FORMATS USED IN DRAWINGS

There are accepted standards or methods that architects and engineers use to present graphic information. Different views ensure that all required information is available on the drawings. There are six main graphic formats:

- Plan Views
- Elevations
- Sections
- Details
- Schedules
- Diagrams

Each method illustrates the various aspects of a project from a different viewpoint. The information is most effectively presented when multiple views are used together. Showing the same item in different views helps confirm and add to the information that can be seen in a single view.

Plan Views

The most common graphic view, the plan view, is presented as if the viewer is looking down on the space. Plan views form the basis of the project and often provide the most complete view. The most common plan view is the *architectural floor plan,* which shows doors, windows, walls, and partitions. It provides the "big picture" view of the space.

Variations of plan views include *structural, fire suppression, plumbing, HVAC,* and *electrical plans.* Each shows the work of the respective trades in plan view as they fit into the architectural floor plan. Other types of plan views include *reflected ceiling plans*, which illustrate the ceiling as it would appear in a mirror, and *partial plan views,* which illustrate a particular area and enlarge it for clarity. Partial views are most often used in areas of high congestion or detail. *Demolition plans* show proposed changes to the existing floor plan. *Roof plans* show the roof layout as would be seen from overhead.

Plan views provide dimensions, which help you to calculate areas. Dimensions should be accurate, clear, and complete, showing both exterior and interior measurements of the space. Plan views are also a starting point from which the architect directs the reader to other drawings for more information.

Elevations

Elevations provide a pictorial view of the walls of the structure, similar to a photograph of a wall taken perpendicular to both the vertical and the horizontal planes. Exterior elevations may be titled based on their location with respect to the headings of a compass (north, south, east, or west elevation) or their physical location (front, rear, right side, or left side elevation). The scale of the elevation should be noted either in the title block or under the title of the elevation.

Interior elevations provide views of the walls of the inside of a room. They illustrate architectural features, such as casework, standing and running trims, fixtures, doors, and windows. Exterior elevations provide a clear depiction of doors and windows, often using numbers or letters in circles to show types that correspond to information provided in the door and window schedule. In addition, elevations show the surface materials of walls, and any changes within the plane of the elevation or facade. While the floor plan shows measurements in a horizontal plane, elevations provide measurements in a vertical plane with respect to a horizontal plane. These dimensions provide a vertical measure of floor-to-floor heights, windowsill or head heights, floor-to-plate heights, roof heights, ceiling heights, or a variety of dimensions from a fixed horizontal surface. The dimensions are provided for use in calculating measurements, areas, and volumes for specific tasks.

Building Sections

The building section, commonly referred to as the *section,* is a "vertical slice" or cut-through of a particular part of the building. It offers a view through a part of the structure not found on other drawings. Several different sections may be incorporated into the drawings. Sections taken from a plan view are called *cross-sections*; those taken from an elevation are referred to as *longitudinal sections* or simply *wall sections.* Wall sections provide an exposed view of the building components and their arrangement within the wall itself. By referring to sections, in conjunction with floor plans and elevations, a reader can visualize the composition of the building component.

Details

For greater clarification and understanding, certain areas of a floor plan, elevation, or a particular part of the drawing may need to be enlarged. This enlargement provides information that is critical to a part of the building item that may otherwise not be available in another view. Enlargements are drawn to a larger scale and are referred to as *details.* Details can be found either on the sheet where they are first referenced or grouped together on a separate detail sheet included in the various disciplines they reference. The detail is shown in larger scale to provide additional space for dimensions and notes. Details are not limited to architectural drawings but can be used in structural and site plans and, to a lesser extent, in mechanical or electrical plans.

Schedules

In an effort to keep drawings from becoming cluttered with too much printed information or too many details, architects have devised a system to organize all types of repetitive information in an easy-to-read table, known as a *schedule.* Schedules list information pertaining to a similar group of items, such as doors, windows, room finishes, columns, trusses, and light or plumbing fixtures. The most common schedules are door, window, and room finish schedules. However, information on any repetitive type of item can be assembled into a table and incorporated in a set of drawings.

Schedules are not limited to architectural drawings but can be found in any discipline included within the set. A typical door schedule lists each door by number, or *mark,* and provides information on size and type, thickness, frame material, composition, and hardware. In addition, the door schedule provides specific instructions or requirements for an individual door, such as fire ratings, undercutting, weatherstripping, or vision panels. In the "remarks" portion of the schedule, the architect lists any nonstandard requirements or special notes to the installer.

Diagrams

Some of the information presented in the set of drawings is more diagrammatical than pictorial. A *diagram* illustrates how the various components of a system are configured, and is often provided for purposes of coordination. Diagrams are commonly used for mechanical and electrical drawings, because of the complex nature of the work. Common examples include diagrams for fire alarm risers, waste and vent piping risers, and fire protection.

DRAWING CONVENTIONS

Certain conventions have been adopted to provide a standard for drawings—from one design firm to another. The most common graphic features are lines, in-fill techniques, and shading, which can often contain subtle but very important information relative to the detail shown. While most of these conventions are widely accepted and practiced, there will always be minor deviations based on local practices. This is most apparent in the use of abbreviations and symbols. In many cases, any unfamiliar symbols and abbreviations will usually become clear by studying the drawings.

Lines

Drawings must convey a great deal of information in a relatively small space, where there is no room for a lot of wording. Consequently, different types of lines are used to communicate information. The most common ones are discussed as follows:

- **Main object line:** A thick, heavy, unbroken line that defines the outline of the structure or object. Used for the main outlines of walls, floors, elevations, details, or sections.
- **Dimension line:** A light, fine line with arrowheads or tick marks at each end, used to show the measurements of the main object lines. The arrowheads fall between extension lines that extend from the main object lines to show the limits of the item drawn. The number that appears within the break in the dimension line is the required measurement between extension lines.
- **Extension line:** A light line that extends from the edge or end of the main object line, touching the arrowheads. Used together with dimension lines to help you determine the limits of a particular feature.
- **Hidden or invisible line:** A light dashed line of equal segments that indicates the outlines of an object hidden from view, under or behind some other part of the structure, such as a foundation shown in elevation that would be below grade.
- **Centerline:** A light line of alternating long and short segments that indicates the center of a particular object. Frequently labeled with the letter "C" superimposed over the letter "L."

Material Indication Symbols and Shading

In-filling certain graphic features on a drawing helps convey their content or composition. In-filling can indicate whether the feature is solid, as in the case of cast-in-place concrete, or hollow, as with concrete masonry block. In-fills are called *material indication symbols.* Because of the different views used on drawings, various materials must be recognizable at each view, from plan to section to elevation. As with abbreviations, material indications symbols are subject to change based on specific materials used in various parts of the country.

Shading

Architects and engineers can convey information in a subtler manner by changing the intensity of a particular feature. This effect, called *shading,* increases or decreases the focus on the item, merely by its intensity. Items in the foreground or focus are often drawn darker or thicker. Objects in the background are lighter in color and drawn less sharply. Shading is often used to differentiate between proposed and existing work on renovation projects.

Graphic Symbols

Graphic symbols are another means of providing a standardized way to recognize information and depict repetitive information on drawings. *Section markers* indicate where a section is cut through an object and can be directional or nondirectional. *Elevation symbols* direct the reader to the drawing that contains a noted elevation. They indicate differences in vertical height, such as the distance between floors, and provide a reference point to use in calculating the height of components in walls or partitions.

Frequently, the design professional draws a feature and, to save space on the page, uses a *break in a continuous line.* This symbol conveys that the feature is not drawn to scale. Geometric shapes with letters, numbers, or dimensions within the shape define certain features or main objects. This graphic symbol is frequently used to name windows, doors, rooms, partition types, and ceiling heights. The important information is within the shape, not the shape itself. The shape used is often based on the preference of the individual design professional or the local accepted practice.

Trade-Specific Symbols

Like graphic symbols, trade-specific symbols depict items that are common to the various trades. Because of the highly diagrammatic nature of mechanical and electrical drawings, there is an abundance of unique, trade-specific symbols used on these drawings. Engineers typically provide legends that define the symbols used. Some symbols, such as for a water closet or toilet, are highly recognizable because they mirror the real-life feature.

Abbreviations

Abbreviations are used to save design professionals time, as well as space, on drawings. There is a wide and varied selection of abbreviations used in daily practice. It is not necessary to memorize each abbreviation. Standard practice is to list the abbreviations on the cover sheet of the set of drawings. This compilation of abbreviations saves time by locating the meaning of each abbreviation in a central location.

Scale

Since there are various physical limitations to drawing a building's actual size on a piece of paper, the drawings retain their relationship to the actual size of the building using a ratio, or *scale,* between full size and what is seen on the drawings. There are two major types of scales: the *architect's scale* and the *engineer's scale*.

Architect's Scale

The architect's scale is used for building drawings, as well as the engineering disciplines. The actual architect's scale may be flat, like a ruler, or three-sided. The three-sided architect's scale has ten separate scales: 1/8″ and 1/4″, 1″ and 1/2″, 3/4″ and 3/8″, 3/16″ and 3/32″, and 1–1/12″ and 3″. The one remaining side is in inches, similar to a ruler. For example, when used on a floor plan that is 1/4″ scale, each 1/4″ delineation represents 1-0″. The same rules apply for 1/8″ scale, in that each 1/8″ segment on the drawing represents 1-0″ of actual size. The same approach applies to each of the other scales. There is no strict convention that states which scale should be used on which drawings. In general, as the area of detail being drawn becomes smaller, the scale often increases. For example, a floor plan may be fine at 1/4″ = 1-0″, yet the detail of an element within that floor plan would be better illustrated in 1/2″ or 3/4″ = 1-0″ for clarity.

Engineer's Scales

The engineer's scale is similar to the architect's scale and is typically (though not exclusively) used to prepare civil drawings. The difference is the size of the increments on the sides of the scale. The engineer's scale has six scales: 10, 20, 30, 40, 50, and 60. For example, the 10 scale refers to 10 feet per inch; the 20 scale is 20 feet per inch, and so on. Other specialty scales are divided into even smaller increments, such as 100.

The engineer's scale is used to measure distance on site plans, when it is greater than would be encountered in the plans of the building. Occasionally, architects and engineers include a detail strictly for visual clarification. These details are labeled NTS, meaning "Not to Scale." This lets the reader know that the details are not for determining quantities and measurements but for illustrating a feature that would otherwise be unclear. Diagrams are also typically not drawn to scale.

Civil Drawings

Commercial and custom residential projects typically include a *site plan,* which illustrates the relationship of the proposed structure to the building's lot, as well as the various site improvements needed to accommodate the new building. The grouping of different types of site drawings, such as utility and drainage, grading, site improvement, and landscaping plans, is known under the general classification of *civil drawings.* Civil drawings encompass all work that pertains to a project, other than the structure itself. They have some unique conventions and nomenclature that merit a separate review. The most obvious difference between civil drawings and architectural drawings is the use of the engineer's scale. (As mentioned earlier, smaller scales are used on site drawings to indicate much larger areas.) It is important to note the scale in order to avoid errors in measuring during the takeoff. To avoid confusion, it is best to use the title block to clarify the type of drawing and scale.

The following sections review the most common terms and symbols associated with the various civil drawings.

Site Plan

The main purpose of the site plan is to locate the structure within the confines of the building lot. Even the most basic site plans clearly establish the building's dimensions, usually by the foundation's size and the distance to property lines. The latter, called the *setback* dimensions, are shown in feet and hundredths of a foot, versus feet and inches on architectural drawings. For example, the architectural dimension of 22′-6″ would be 22.50′ on a site plan. This decimal system is used because it is the basis of measurement for the land surveyor, the engineer predominantly responsible for laying out the site.

As a starting point for the site design, a site survey is performed by a registered land surveyor, who also records special conditions. These may include existing natural features, such as trees or water, as well as man-made improvements, such as walks, paving, fences, or other structures. The new site plan shows how the existing features will be maintained, modified, or removed to accommodate the new design.

Another chief purpose of the site plan is to show the unique surface conditions, or *topography,* of the lot. Changes in the elevation of the lot, such as slopes, hills, valleys, and other variations in the surface, are shown on a site plan by means of a *contour,* which is a line connecting points of equal elevation. This convention is used to show three dimensions: length, width, and height on a two-dimensional medium—paper. An *elevation* is a distance above or below a known point of reference, called a *datum.* The datum could be sea level, or it could be an arbitrary plane of reference established for the particular building. For projects in which the topography must be shown separately for clarity, a *grading plan* is used. The grading plan typically shows the existing and proposed contours as dashed and solid lines, respectively.

A known elevation on the site for use as a reference point during construction is called a *benchmark*. The benchmark is established in reference to the datum and is commonly noted on the site drawing with a physical description and its elevation relative to the datum. For example: "*Northeast corner of catch basin rim—Elev. 102.3* might be a typical benchmark found on a site plan. When individual elevations, or *spot grades,* are required for other site features, they are noted with a + and then the grade. For example: *+123.45* would designate a spot grade for a particular feature. (Grades are accurate to two decimal places, whereas contours are expressed as whole numbers.) Some site plans include a small map, called a *locus,* showing the general location of the property in respect to local highways, roads, and adjacent pieces of property.

Grades are used to calculate differences in vertical elevation and are extrapolated over the area of the site to determine quantities of excavation and backfill involved on a site.

Drainage and Utility Plans

Larger projects have several site plans showing different scopes of related or similar work, such as drainage and utility plans. Utility drawings show locations of water, gas, sanitary sewer, telecommunications, and electric utilities that will service the building. Drainage plans detail how surface water will be collected, channeled, and dispersed on- or off-site. Both plans illustrate, in plan view, the size, length, and type of pipes and special connections or terminations of the various piping. Because the effluent in certain types of pipe moves by gravity, the elevation of each end of the pipe must be different.

Certain site plans require clarification in the form of a detail, similar to the architectural detail. Classic examples are sections through paving, precast structures, pipe trenches, and curbing. Details are not limited to scaled drafting, but occasionally appear in the form of perspective drawings, which are not drawn to scale and are used as a means of clarification only.

Landscaping Plans

Landscaping plans show the locations of various species of plantings, as well as lawns and garden areas. The plantings are noted with an abbreviation, typically three letters, along with the quantity of the particular species. This designation corresponds to a planting schedule, which is a complete listing of plantings by common name, Latin or species name, and quantity and size. Notes describing planting procedures or handling specifications accompany the schedule. Irrigation drawings may be included, which illustrate how the landscaping elements will be watered.

Paving/Curbing Layout Drawings

To accurately show the layout of parking lots and driveways, a *paving/curbing layout drawing* is needed. This plan shows the various types of bituminous, concrete, and brick paving and curbing, and the limits of each—helpful for calculating areas and measurements. Again, it is important to review the legend symbols in order to clearly delineate where one material ends and another begins. Details showing sections through the surface are used to differentiate between thickness and the substrate below.

Site Improvement Drawings

When the project warrants, separate drawings may be needed to clarify various site improvements, such as walks, retaining walls, patio paving, fences, steps, benches, play areas, and flagpoles. Site improvement drawings are often used as a catchall to show the miscellaneous items that do not fall neatly into one of the aforementioned classifications of work. The estimator is advised to carefully review this drawing for miscellaneous items that are commonly left out of the estimate.

Existing Conditions Site Drawings

For projects with existing drainage, utilities, and structures, an *existing conditions plan* is provided, which is invaluable for understanding and calculating the difference between actual conditions and proposed work. The existing conditions are shown in the background grayed out or lightly shaded, and the new work is shown darker in the foreground. Other methods include showing existing conditions as dotted or broken lines and proposed conditions as solid, darker lines. Sometimes test boring logs are provided, which document engineering tests to determine the load-bearing and general quality of the subsurface at the site.

Site Visits

It is becoming increasingly common for Owners or Awarding Authorities to provide access and a tour of the site prior to bid**.** This site visit is called the *prebid walk-through.* Many projects are requiring mandatory attendance at the prebid walk-through as a way of reducing change requests resulting from not visiting the site. While site visits are not specifically part of the plans, they have the benefit of resolving questions that most often arise from the plans.

It is essential to become familiar with the drawings prior to the site inspection and start of the quantity takeoff. One recommended procedure is to review the plans with a pad of paper nearby. As questions arise, jot them down. As the review progresses, many answers to the questions become readily apparent and can be removed from the list. Any remaining questions may be answered during the specification review or during the prebid walk-though.

CONCLUSION

This chapter reviewed the different types of plans and drawing elements that together constitute a full set of working drawings. The working drawings, along with the specifications (*discussed in Chapter 2*), are the bid documents. The bid documents, along with a site visit, are the basis of the estimate.

Working drawings are only part of the contract documents. They comprise the graphic representation of the design professional’s intent. Plans illustrate the project in a format that allows the estimator to determine quantities as part of the takeoff process.

A thorough review of the drawings often reveals discrepancies, conflicting information, or even omissions and helps determine whether to proceed with the next step in bidding the job. Note that the various views should be used together. Information located on one drawing can often be corroborated on another. This is part of a checks-and-balances process that is fundamental in estimating.