Blueprint Reading

The Role of the Blueprints(Graphics)

- The three terms most often used to refer to the graphic portion of the bidding documents for a residential or light commercial building project are:
  - Plans
  - Drawings
  - Blueprints
- These terms refer to the graphic representation or illustration of the building project on paper and are typically comprised of:
  - Lines
  - Symbols
  - Abbreviations
- Drawings are the quantitative representation of the project that represents the owner's wishes, as interpreted by the architect/engineer

Design Development

- Most plans, drawings, or blueprints develop over several generations of review and modification as a result of :
  - Owner input
  - Coordination with other design disciplines
  - Building code compliance
  - General fine-tuning
- This process is known collectively as “Design Development”
- Design development occurs before the release of the final version of the plans, drawings, or blueprints and are known as the “working” plans, drawings, or blueprints.
- “Working” drawings are the completed design, a code compliant representation of the building project, ready for bidding and, ultimately, construction

Organization of the Working Drawings

- Architectural drawings
- Structural drawings
- Mechanical drawings
- Electrical drawings
- Specialty drawings
- Site drawings

Architectural Drawings

- Core drawings showing the layout of the building and its use of space
- Convey the aesthetic value of the structure and show the dimensions and placement of all key features
- The first architectural drawings in a set of drawings generally show large areas in less detail
- As one progresses through the architectural set, the level of detail increases
- These drawings are generally prefixed by the letter “A” and are 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(e.g. columns and beams are designed to avoid interrupting a space)
- Structural drawings are generally 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 generally use the letter “P”, and fire suppression drawings generally use “FP” (fire protection), “SP” (sprinkler system), or “F” (fire)
- All drawings are sequentially numbered

Electrical drawings

- Illustrate the electrical requirements of the project, including power distribution, lighting, and low-voltage specialty wiring, such as 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 generally 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
- They are generally 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 generally sequentially numbered and can have a less formal naming convention, open to the interpretation of the design engineer
- However they are generally easily recognized for the core drawings, since they only deal with the site

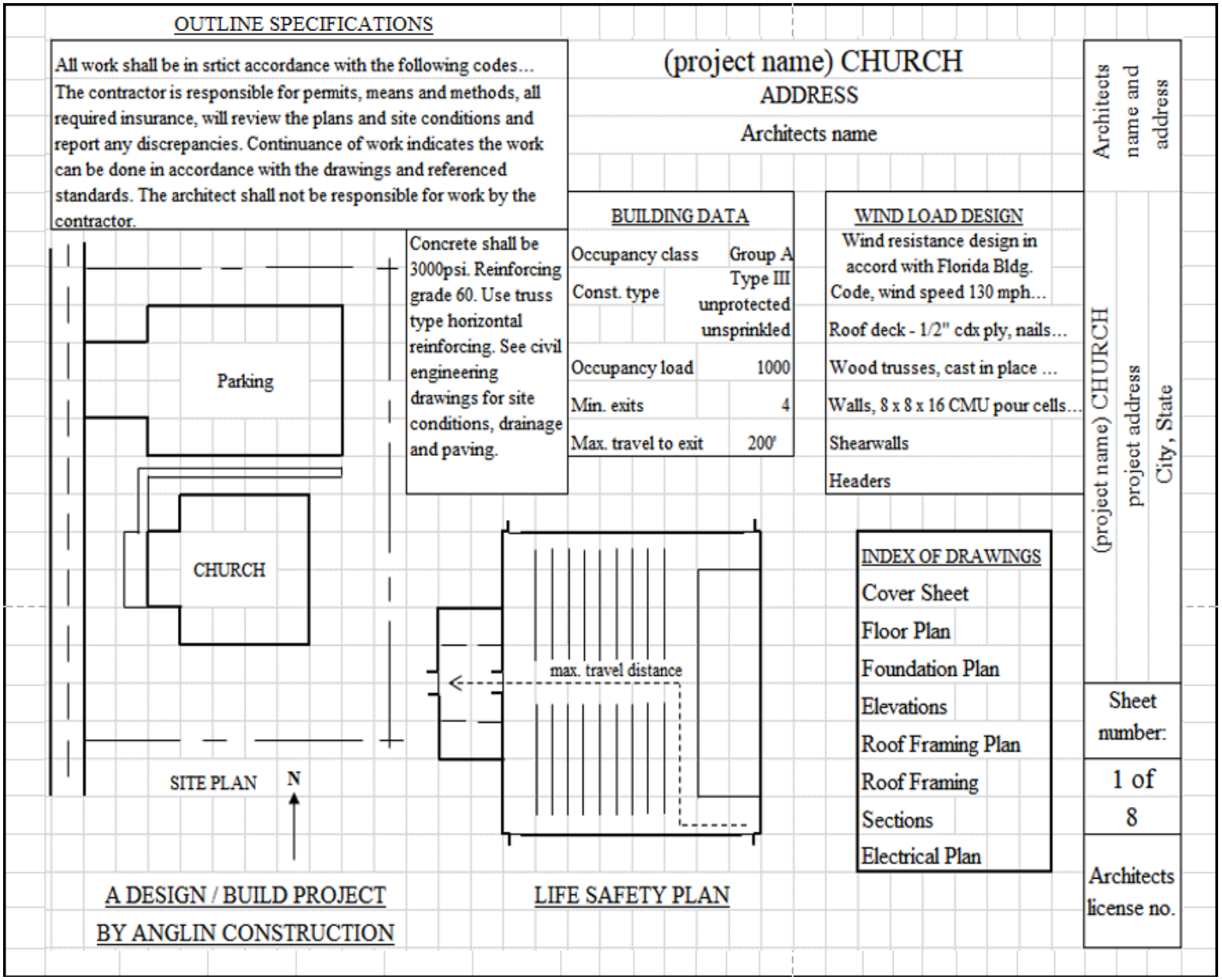
Basic elements in a set of drawings

- Cover sheet
- Title block
- Revisions

Cover Sheet

- 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
- Also lists the drawings that constitute the drawing set in the order they will appear
- The list of drawings 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
- Another element on the cover sheet is a list of abbreviations or graphic symbols used in the drawing set

Example



Title block

- The title block is generally located along the right side, on the bottom, or in the lower right-hand corner of the drawing (locations can vary by design firm or owner preferences)
- 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
- 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.

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

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 ¼", 1" and ½", ¾" 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 ¼" scale, each ¼" 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 ¼" = 1-0", yet the detail of an element within that floor plan would be better illustrated in ½" or ¾" = 1-0" for clarity.

Engineer's scale

- 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.

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
  - Details
  - Schedules
- Each format illustrates the various aspects of a project from a different viewpoint.

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
- 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 the starting point from which the architect directs the reader to other drawings for more information

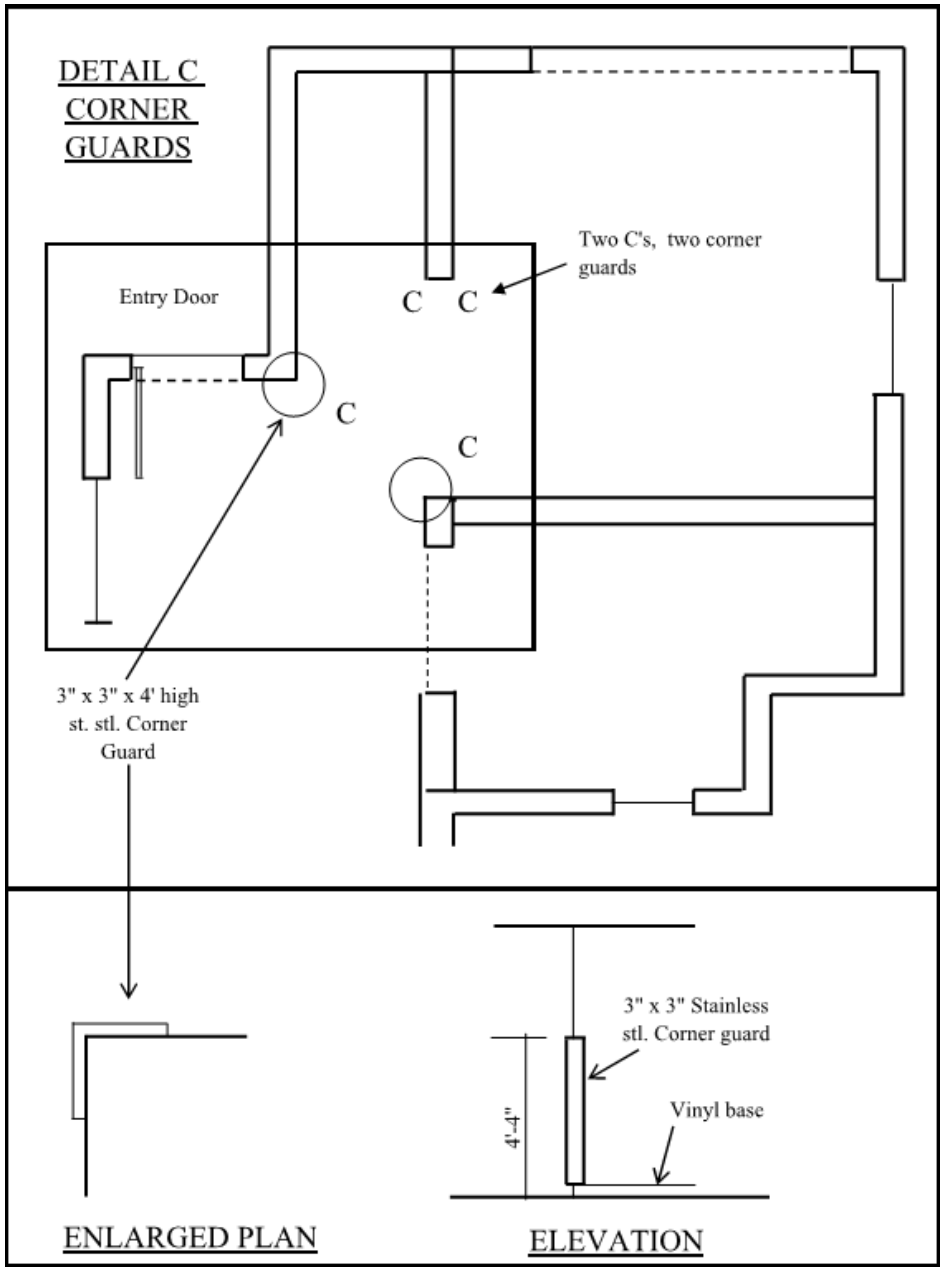
Elevations

- 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 work tasks.

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.

Example



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, weather-stripping, or vision panels. In the “remarks” portion of the schedule, the architect lists any nonstandard requirements or special notes to the installer.

Example

ROOM FINISH SCHEDULE

				WALLS						
ROOM NO.	ROOM NAME	FLOOR	BASE	NORTH	EAST	SOUTH	WEST	CEILING	CLG. HT.	REMARKS
100	ENTRY	VCT	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	
101	MEETING ROOM	CPT-2	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	
102	STAFF LOUNGE	VCT	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	
103	TOILET	VCT	VINYL	PAINT	PAINT	PAINT	PAINT	GWB/Paint	9'	EPOXY PAINT
104	JANITOR	VCT	VINYL	PAINT	PAINT	PAINT	PAINT	GWB/Paint	9'	EPOXY PAINT
105	HALL	VCT	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	
106	OFFICE	CPT-1	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	
107	ADMIN	CPT-1	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	
108	TOILET	VCT	VINYL	PAINT	PAINT	PAINT	PAINT	GWB/Paint	9'	EPOXY PAINT
109	OFFICE	CPT-2	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	
110	CUBICLES	VCT	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	
111	OFFICE	CPT-2	VINYL	PAINT	PAINT	PAINT	PAINT	S.A.C.T.	10'	

FINISH NOTES

INSTALL A.D.A. COMPLIANT TRANSITION STRIPS AT ALL CHANGES IN FINISH FLOORING. ALL TRANSITION STRIPS AND CHANGES IN FLOORING SHALL BE CENTERED BELOW DOORS.

ALL G.W.B. AT RESTROOMS TO BE WATER RESISTANT.

ALL G.W.B. TAPED, SANDED, AND SMOOTH, "LEVEL 4" FINISH.

PROVIDE CONTROL JOINTS IN G.W.B. PER SPECIFICATIONS.

INSTALL SOLID BLOCKING IN WALLS AS NEEDED FOR EQUIPMENT, ACCESSORIES, AND TRIM.

FINISH SPECIFICATIONS

FLOORING	CPT-1	CARPET TILE. CRAFT MODULAR, 00650, "WHIRL".
	CPT-2	CARPET TILE. CRAFT MODULAR, 00422, "DUSTY".
	VCT	VINYL COMP. TILE, XYZ BRAND, 12" X 24", "HONEY".
BASE	VINYL	4" HIGH BLACK
WALLS	PAINT	1 COAT PRIMER 2 FINISH COATS.
CEILING	GWB/Paint	1 COAT FLAT
CEILING	S.A.C.T.	SUSPENDED ACOUSTICAL CEILING TILE.

Further study

- Below are a couple of good texts for further study and reference:
  - Printreading for Residential and Light Commercial Construction, Sixth Edition, by Thomas E. Proctor and Leonard P. Toenjes.
  - Print Reading for Construction, Residential and Commercial, Seventh Edition, by Walter C. Brown and Daniel P. Dorfmueller.

- Web search for: “Plan reading” or “Blueprint reading”. There are number of additional resources available online.

- Search the same keywords on Youtube too.

Summary

- This section reviewed the different types of plans and drawing elements that together constitute a set of working drawings.
- 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.
- Continuing, refreshing or broadening your blueprint reading abilities is one of the keys to success for construction professionals.

Questions