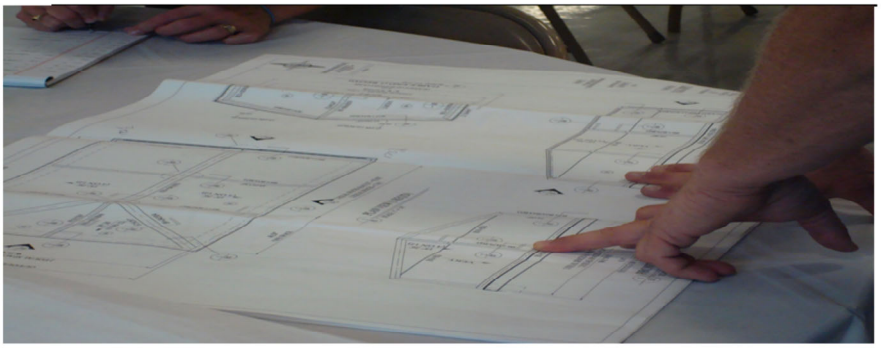
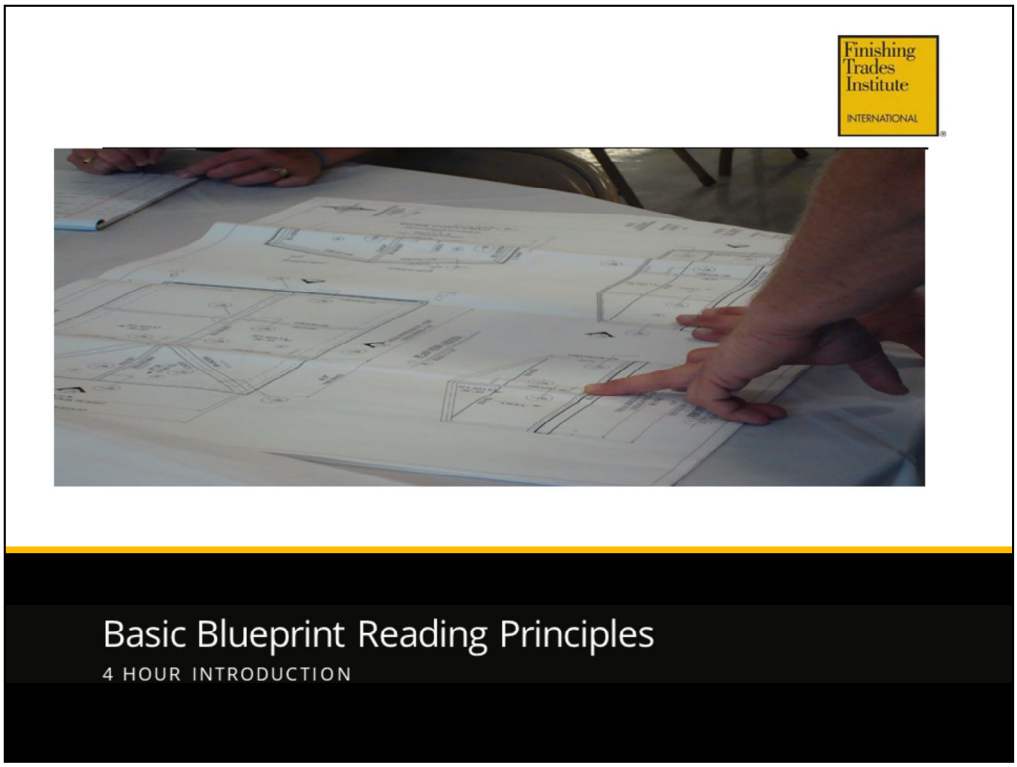
Instructor Copy

Finishing Trades Institute INTERNATIONAL

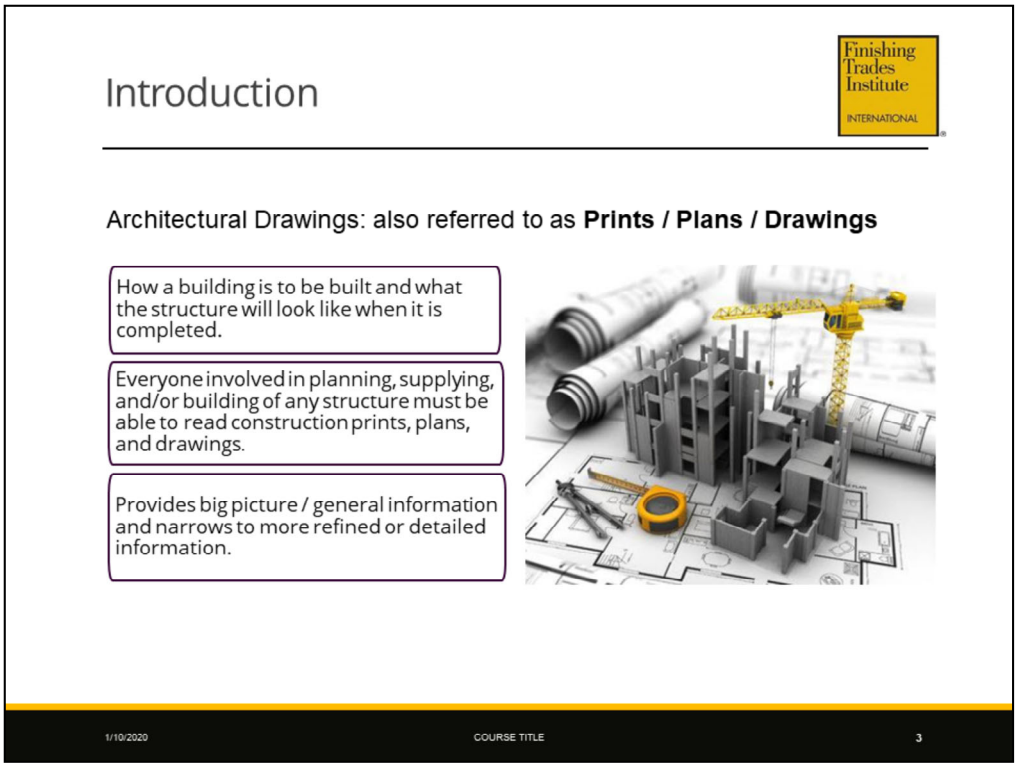


Basic Blueprint Reading Principles

4 HOUR INTRODUCTION



Instructor Notes:
Welcome students to this course, they will explore the fundamental makeup of a set of architectural plans, including the use, purpose, and common components of any plan. This is the first module in a series designed to teach you how to read and interpret blueprints, plans, or drawings.



Instructor Notes: Communicate to students that blueprints, or construction drawings, are the sets of detailed architectural drawings used by a homebuilder and contractors to construct a house or building.

Gain Attention: Stress that blueprints, along with the specifications outline provided with the house or building plans package, are typically included as part of the contract documents between the owner and the builder.

Highlight that these documents specify dimensions, materials, locations, construction, finishes, etc. that are to be followed to construct the house plan.

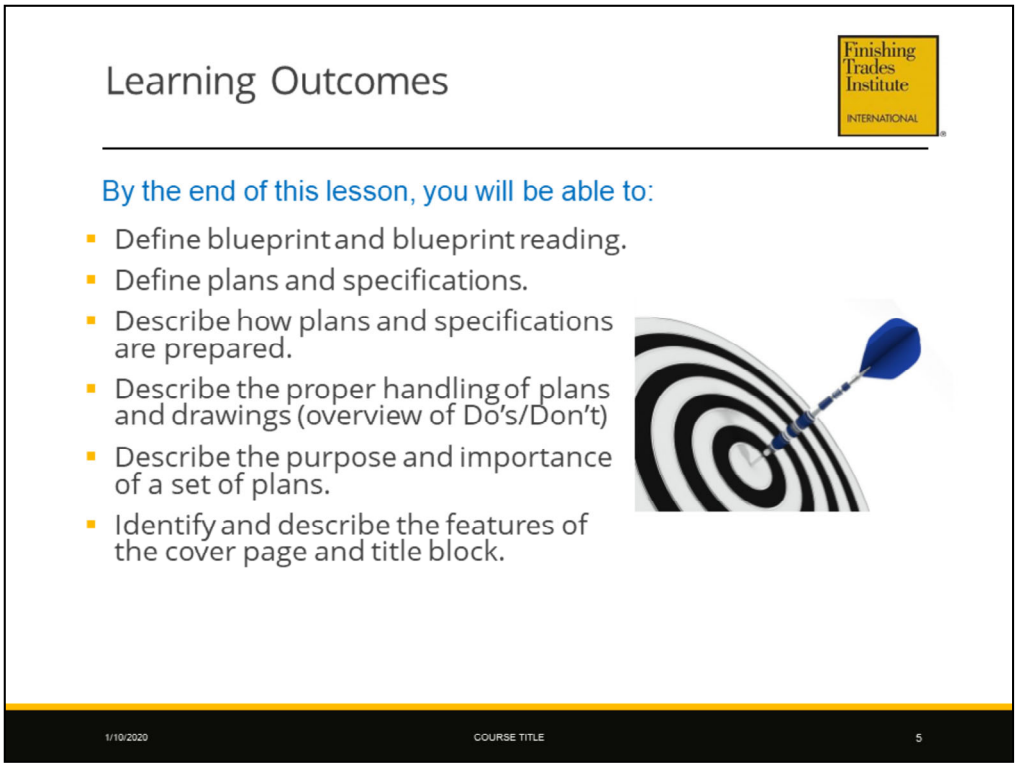
- Prints, plans, and/or drawings communicate how a building is to be built and what the structure will look like when it is completed. Everyone involved in the planning, supplying, and/or building of any structure must be able to read construction prints, plans, or drawings.
- Blueprints and everyday road maps are designed using a similar method. They contain the big picture or general information and narrow to more refined or detailed information. Just as an atlas contains all the information for many different places, a blueprint contains all the information for a structure.

Topics

- Introduction
- Learning Objectives
- Blueprints Defined
- Blueprint Production
- Blueprint Handling
- The "Set of Plans"
- The Importance of Plans
- Plan Components and Use
- Plan Exploration
- Knowledge Check

1/10/2020 COURSE TITLE 4

Instructor Notes: Tell students that this module is designed to provide an introduction and hands on opportunity to begin learning about architectural drawings. The lesson will be approximately 4 hours, including a knowledge check and hands-on-prints exercises.



Instructor Notes:

State the learning objectives of the course to make students aware of what to expect.

Tell the students that this is a basic course designed to take the mystery out of interpreting drawings.

By the end of this course, you will be able to:

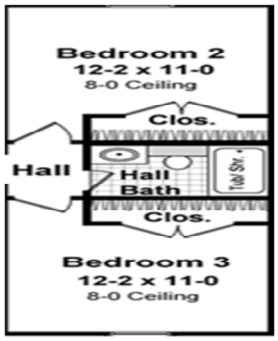
- Describe the purpose and importance of a set of architectural plans.
- Identify and define various components of a set of architectural plans.
- Identify the care and considerations for proper handling and utilization of paper-based and electronic Architectural Blue Prints.
- Differentiate between the types of architectural drawings in a plan (ex., floor plan/plan view, elevations, section view, and details).

What is a Blueprint?

Class Exercise:

Draw the layout/floor plan of their bedroom, kitchen or other room they are familiar with.

Sample house floor plan – 2 bedrooms



1/10/2020 BLUEPRINT READING 4HR 6

Instructor Notes: Show students a simple floor plan (Circulate copies of the Sample House Plan Drawn by CAD) to stimulate the students' interest.

Gain Attention: Show the details of the sample house floor plan – point out the visualization of the room and then conduct the exercise.

Exercise:

Ask students to take 5 minutes to draw the layout (floor plan) of their bedroom or a building that they are familiar with. (use the drawing later)

Inform students that they will have an opportunity to examine blueprints/plans during the study of his blueprint reading course.

Recall Prior Knowledge:

Ask students if they have had an opportunity to work with blueprints to get them to think about what they already know.

If yes, ask how were they involved and to what extent.

If no, inform students that this module is designed to familiarize them with blueprint and other related documents; that it is designed to take the mystery out of interpreting blueprints.

Blueprints, or construction drawings, are the sets of detailed architectural drawings used by builders and contractors to construct a building. There must be a plan put together and designed on prints so the owner and the contractor are on the same page of the design and construction.

Blueprints are a map of the building process and provide a universal language for all professionals to read and interpret drawings, symbols, legends, and elevations. Blueprint reading refers to the process of interpreting a drawing. An accurate mental or visual picture of how the object will look when completed can be formed from the information presented.

From residential construction jobs to large commercial projects, construction plans are required to estimate your costs for materials and labor, obtain your permits, establish a construction schedule, and complete the project in a timely manner.

Ex. A shed in your back yard will not be a detailed plan. But a house or a larger commercial building will require more detailed plans.

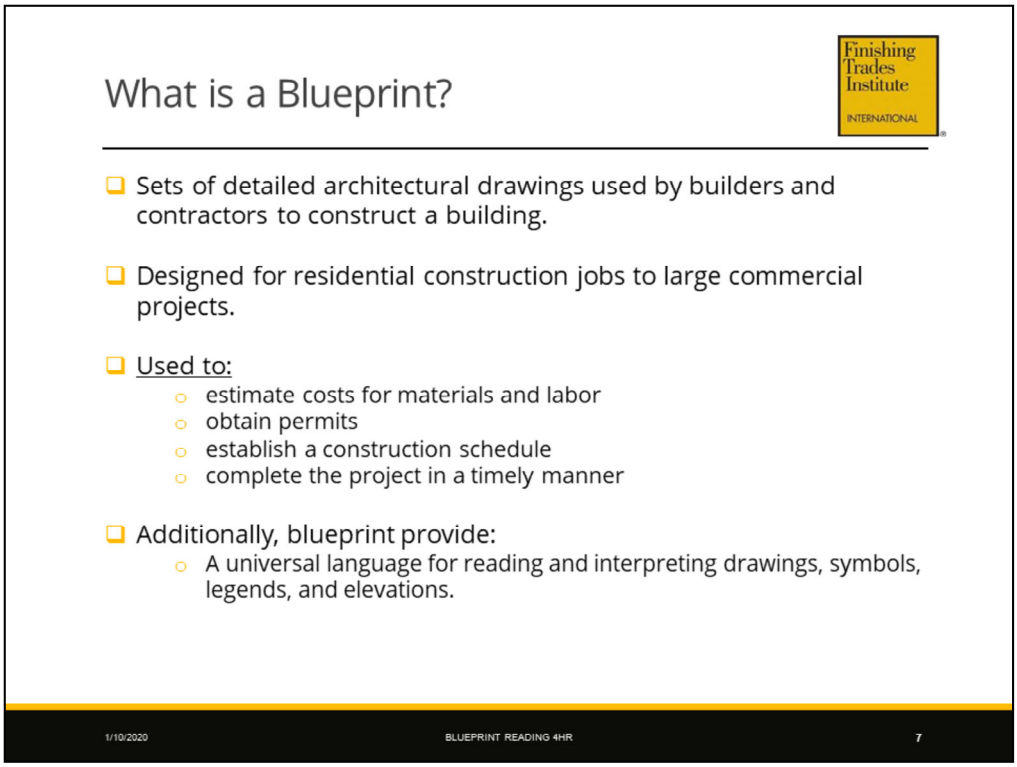
Blueprints are used to:

• Estimate costs for materials and labor

• Obtain permits – Local, State and federal laws- ex. A foundation is dug to the specifications of the region; where the gutters will drain – sump pump must be tied into the gutter drainage

• Establish a construction schedule – timing of the trades - you can't put the roof on until the foundation and walls are constructed

• Complete the project in a timely manner – using blueprints and following the steps to purchase materials and labor and get the permits, etc.



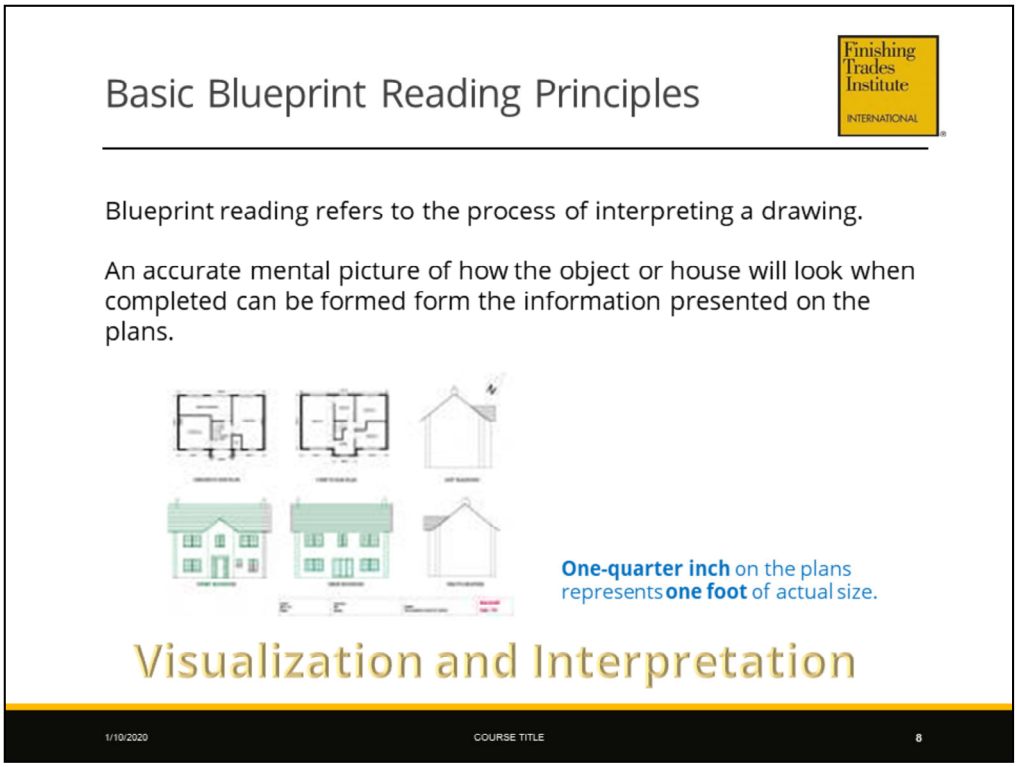
Instructor Notes: Define blueprints

From residential construction jobs to large commercial projects, construction plans are required to estimate your costs for materials and labor, obtain your permits, establish a construction schedule, and complete the project in a timely manner.

Ex. A shed in your back yard will not be as detailed a plan as house, apartment building, or a larger commercial building which will require more detailed plans.

Blueprints are used to:

- Estimate costs for materials and labor
- Obtain permits – Local, State and federal laws- ex. When a foundation is to be dug to the specifications of the region; where the gutters will drain – sump pump must be tied into the gutter drainage
- Establish a construction schedule – timing of the trades - you can't put the roof on until the foundation and walls are constructed
- Complete the project in a timely manner – using blueprints and following the steps to purchase materials and labor and get the permits, etc.



Instructor Notes: Explain why it is important to be able to form an accurate mental or visual image of the intended object (house, building, etc.)

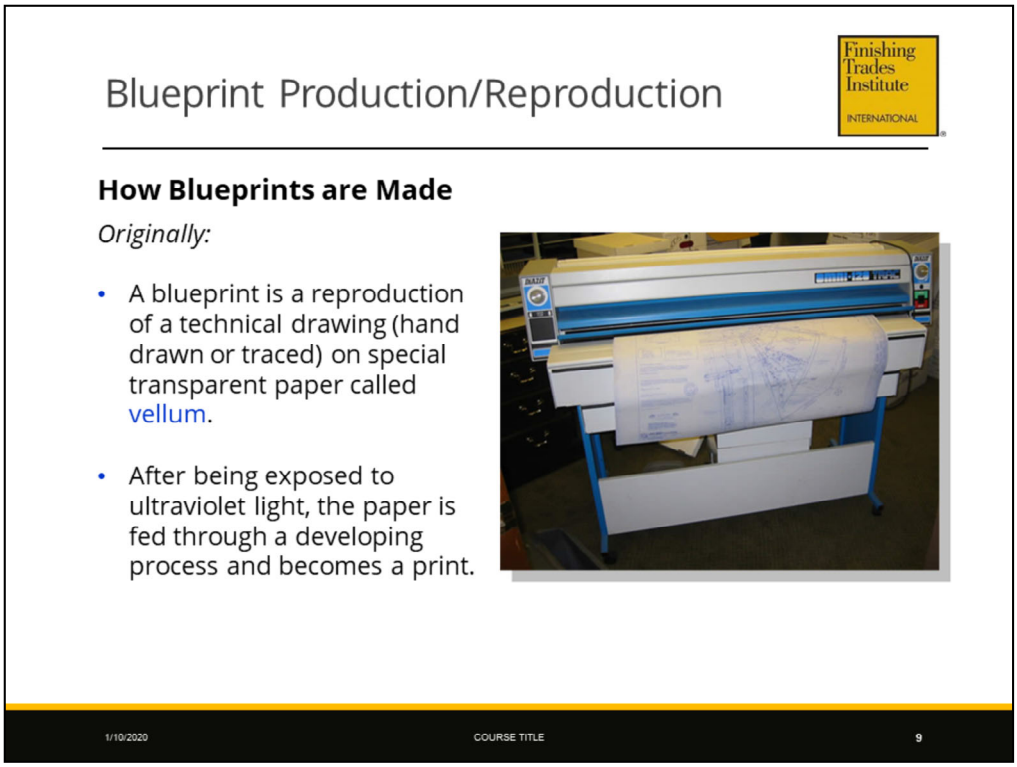
Speaking Points:

Blueprint reading is defined as the gathering of information from a print or plan. It involves two principal elements: **visualization and interpretation**.

- Visualization is the ability to "see" or envision the size and shape of the structure from a set of plans. Interpretation is the ability to "read" lines, symbols, dimensions, notes, and other information on the print or plan.

- Plans use a language that is common to the construction industry. This language is made up of symbols, abbreviations and other specific marks and notations. Without this common language, millions of words and thousands of pages would be needed to explain each job. However, coded language can be difficult to interpret, even with a minimal amount of wording, the possibility of misinterpretation still exists.

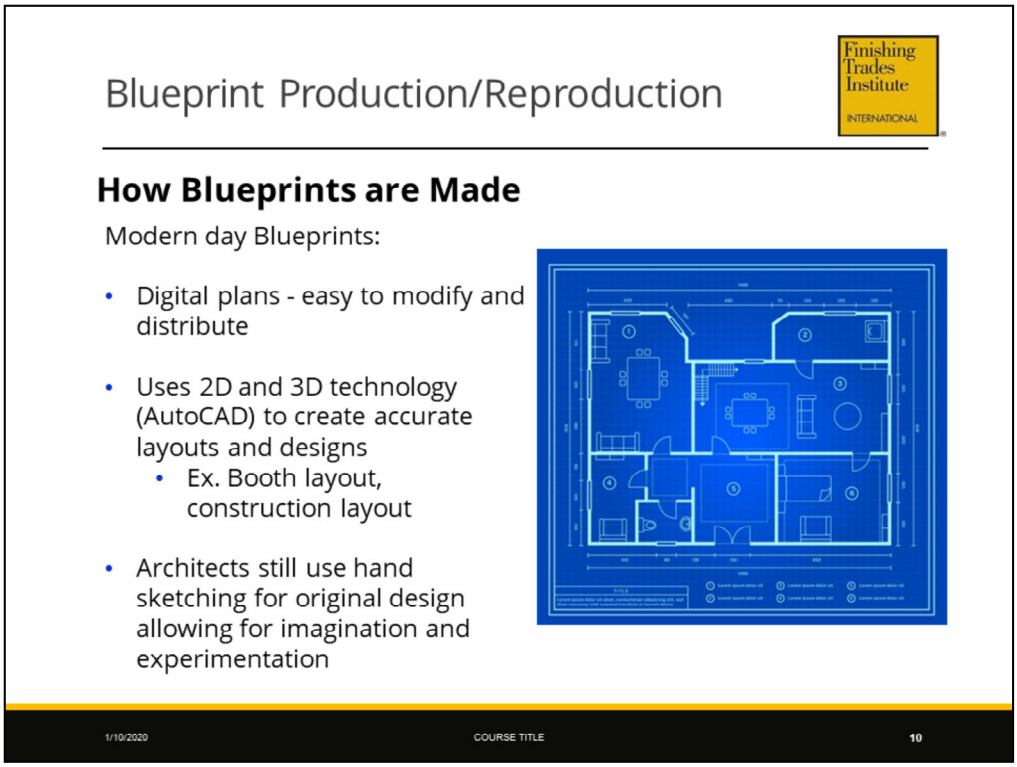
NOTE: Keep in mind that blueprints are drawn to scale – usually at ¼ an inch – meaning every ¼ of an inch on the prints equals ONE FOOT of actual size. An accurate metal picture of how the object or building will look when completed can be formed from the information presented on the plans.



Instructor Notes: Describe how blueprints were originally made.

Originally, architectural drawings were reproduced, using an original drawing or tracing, by a technique that resulted in pages with white lines on blue paper, giving it the name we know as “blueprints."

With the continued advancement of technology throughout the construction industry, engineers and draftsmen are turning to computers to produce digital drawings which can be copied. Digital production of plans are becoming increasingly popular due to ease of making edits, convenience in sharing plans among construction team members, and portability.

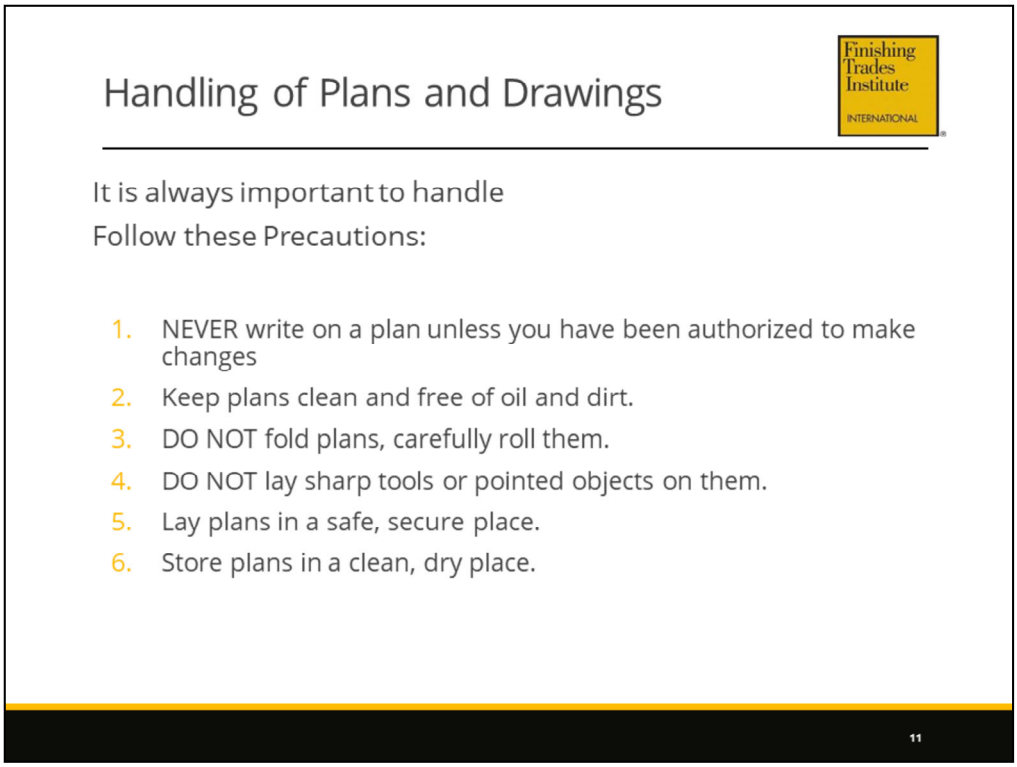


Instructor Notes:

- Discuss the lengthy process of the original blueprint drawing vs. how technology has made it easier, reminding students how important it is that they co-exist. Emphasize regardless of how the plans are presented, the importance of understanding construction drawings remains a top priority.
- Every project is unique, therefore how you interpret the information is critical. It is a lot like having your own language as a construction worker. You need to understand everything on the construction plan (blueprint) to complete the project under budget and ahead of schedule.
- If needed, tell students to perform a web search on computer aided design (CAD) and if they want to explore more about it. For examples: **(OPTIONAL: https://marketbusinessnews.com/financial-glossary/computer-aided-design-cad/**

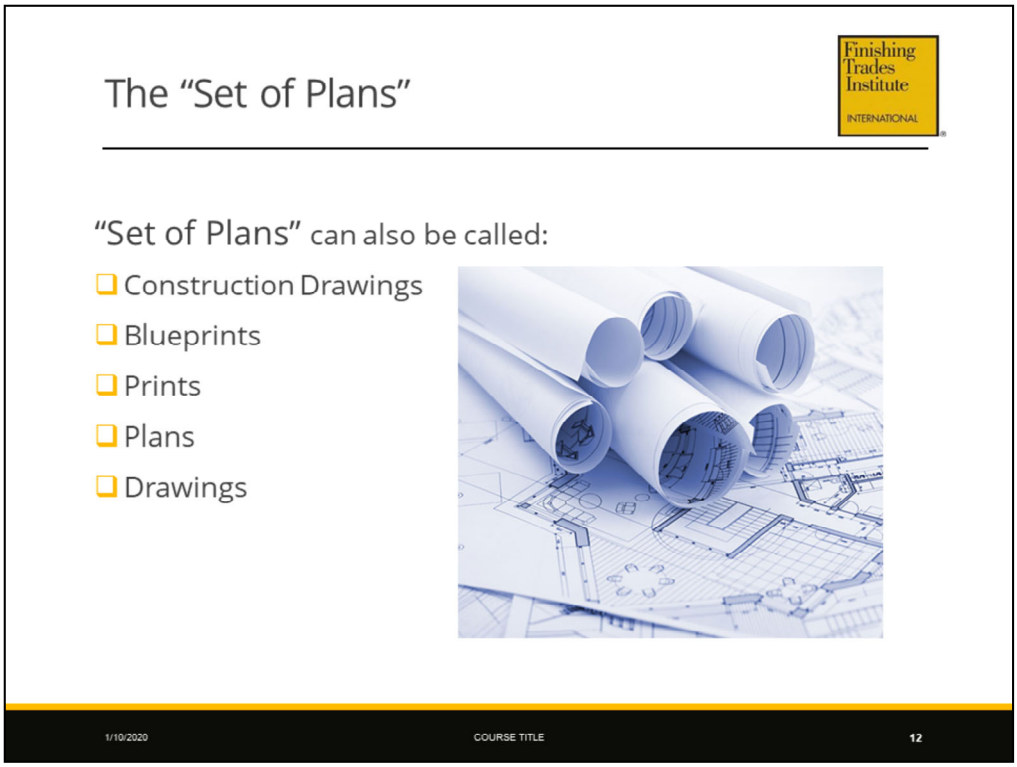
Ask students if they are familiar with computer aided design (CAD).

- If **yes**, ask students to share their experience with the technology.
- If **no**, indicate that the CAD is software for creating precise engineering drawings. Share that engineers use CAD to create two and three dimensional drawings such as those for automobile and airplane parts, floor plans, and maps.
- Highlight hat while it may be faster for an engineer to create an initial drawing by hand, it is much more efficient to change and distribute drawing files electronically.



Instructor Notes: If available, use an old set of plans to demonstrate proper/improper handling of blueprints.
As previously discussed, the set of plans and related specifications sheets are a vital part of any job. By following these precautions, they can be kept usable for a long period of time.

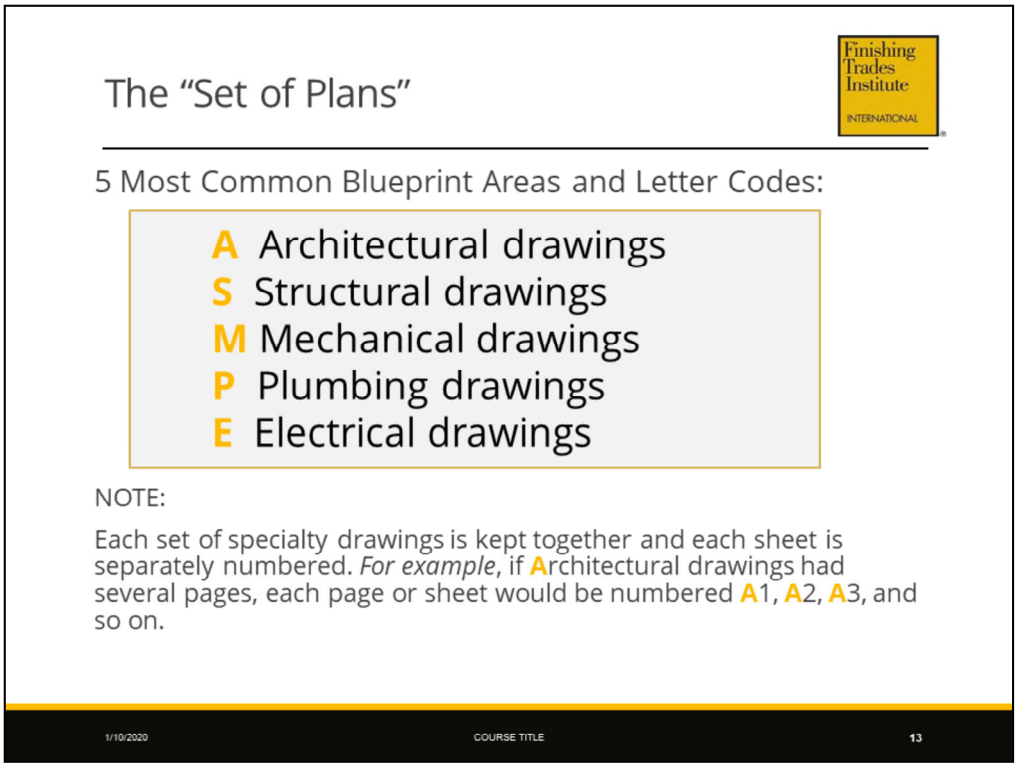
- NEVER write on a plan unless you have been authorized to make changes.
- Keep plans clean and free of oil and dirt. Soiled plans are difficult to read and contribute to errors.
- Roll plans carefully to the inside of the roll to avoid tearing or soiling. Plans should not be folded.
- Do not lay sharp tools or pointed objects on the plans.
- While in use, lay plans in a safe and secure place to avoid being stepped on or damaged by weather.
- When not in use, store plans in a clean, dry place.



Instructor Notes:
Ask if they have heard the phrase "set of plans" as used in the construction industry.

- If yes, allow students to share their experiences.
- If no, then explain to them the term "set of plans."

The term "set of plans" is one name for construction drawings and blueprints. Other commonly used terms include prints, plans or drawings.



Instructor Notes: *Optional:* Show students the blueprint alpha numeric codes **(on screen or in a handout).** Tell the students that these codes are found on the Cover Sheet of the blueprint.

The starting point for understanding any job is to become familiar with the drawings in the set of plans. The drawings are usually grouped in different

Areas much like the index to a book. The five most common areas and the letter codes that usually identify them are these:

Architectural drawings are identified with the letter "A"

Structural drawings are identified with the letter "S"

Mechanical drawings are identified with the letter "M"

Plumbing drawings are identified with the letter "P"

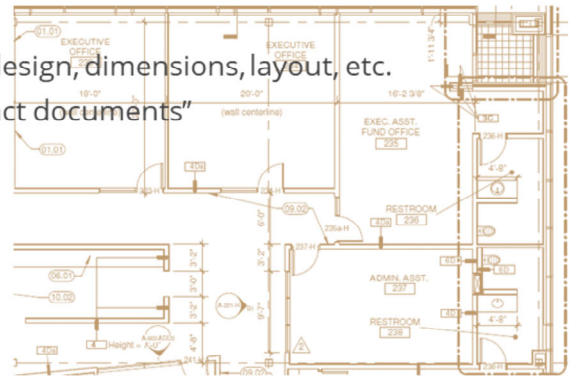
Electrical drawings are identified with the letter "E"

As we explore each of these areas of the blueprint, you will see that they are numbered according to their letter code.

The Importance of Plans

A Set of Plans plays an important role because they:

1. Form the basis of the agreement
2. Assist in bidding
3. Show the structure's design, dimensions, layout, etc.
4. Are part of the "contract documents"



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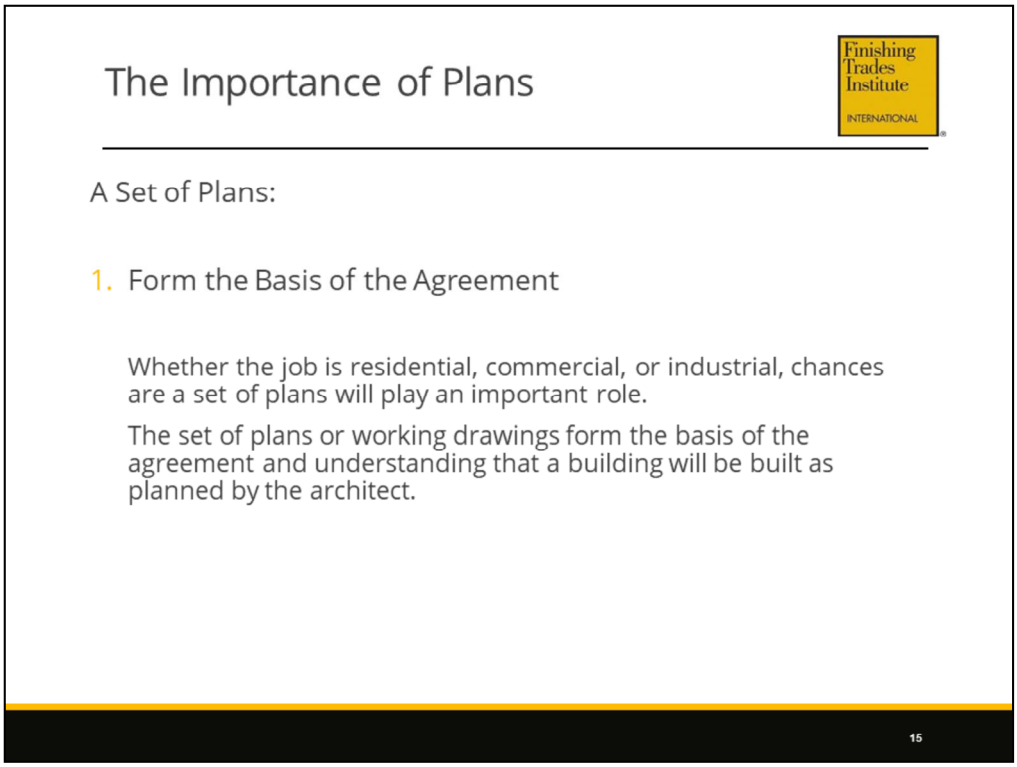
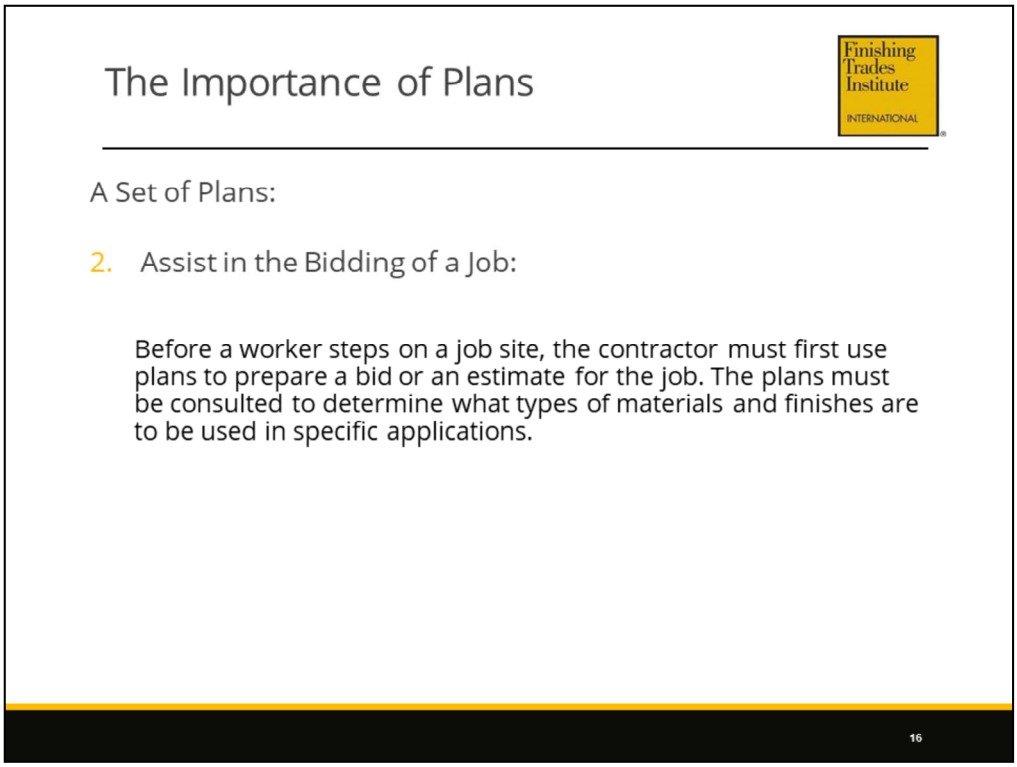
Instructor Notes: Introduce the concept of a Set of Plans. Read aloud the four points to be made about the set of plans and then move to the next slides to provide more detail on each area of importance.



Instructor Notes: Introduce the importance of a set of plans in the overall success of a job.

Whether the job is residential, commercial, or industrial, chances are a set of plans will play an important role. The set of plans or working drawings form the basis of the agreement and understanding that a building will be built as planned by the architect.



Instructor Notes: Introduce the role of the set of plans in bidding a job.

Before a worker steps on a job site, the contractor must first use plans to prepare a bid or an estimate for the job. The plans must be consulted to determine what types of materials and finishes are to be used in specific applications.

The Importance of Plans

A Set of Plans:

3. Show the Structure's Design, Dimensions, Layout, etc:

The set of working drawings or plans graphically shows the structure's design, dimensions, layout, location, and many other specific construction details.

Specifically, the plans and specifications provide information on the following:

1) Building Design
2) Scope of Work
3) Materials Needed
4) Equipment to be Installed
5) Installation Methods

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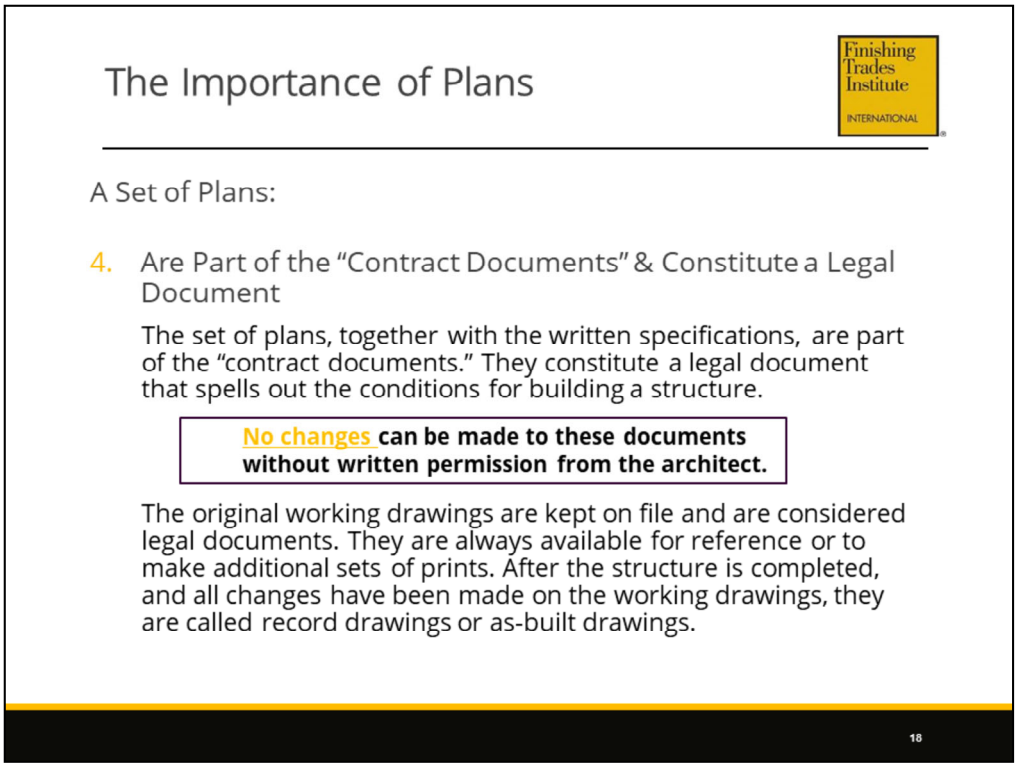
Instructor Notes: Introduce the role of the set of plans in insuring the integrity of the working drawings.

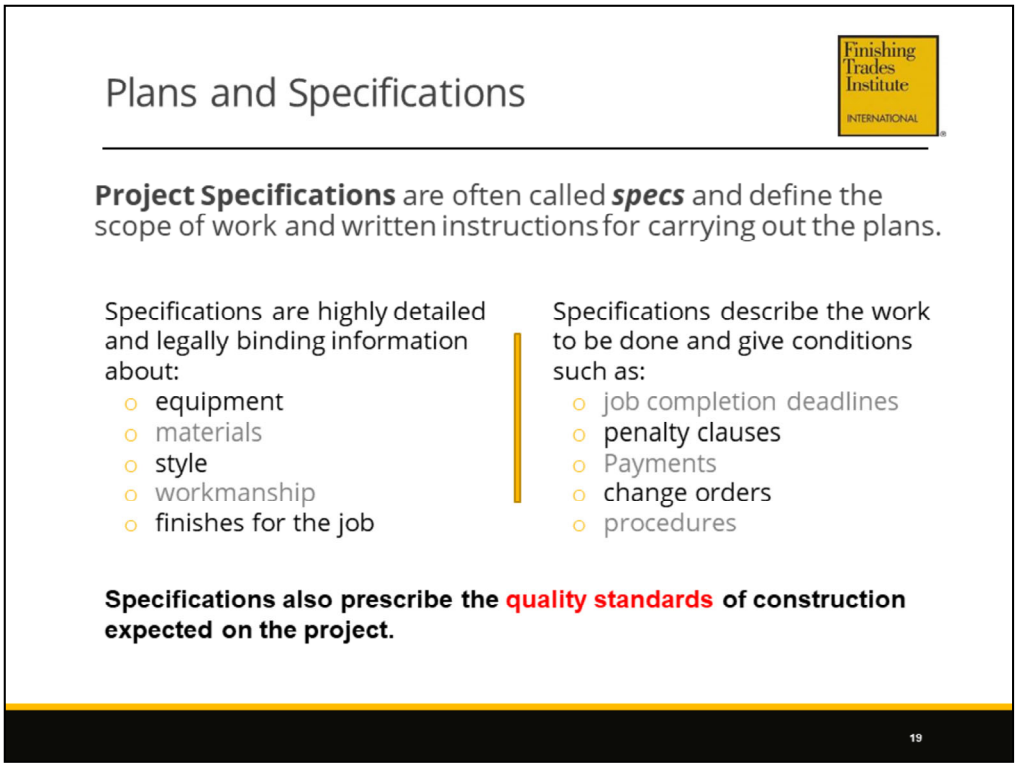
The set of working drawings or plans graphically shows the structure's design, dimensions, layout, location, and many other specific construction details. Specifically, the plans and specifications provide information on all of these: 1) the design of the building, 2) the scope of work to be done, 3) materials to be used, 4) equipment to be installed, and 5) installation methods to be followed.



Instructor Notes: Introduce the term "contract documents" as the legally binding documents of the blueprint design.

The set of plans, together with the written specifications, are part of the "contract documents." They constitute a legal document that spells out the conditions for building a structure. **No changes** can be made to these documents without written permission from the architect.

The original working drawings are kept on file and are considered legal documents. They should be available from the owner, the building engineer for reference or to make additional sets of prints. After the structure is completed, and all changes have been made on the working drawings, they are called record drawings or as-built drawings. The as-builts may be used at a later time if remodeling or modifications need to be made – owners and construction personnel will use the as-builts to reference original materials used in the construction of the building's design such as floor plans, details, cross sections, as well as specifics such as carpet, paint, studs used in the walls, etc.



Instructor Notes: Introduce students to the use and importance of specifications.

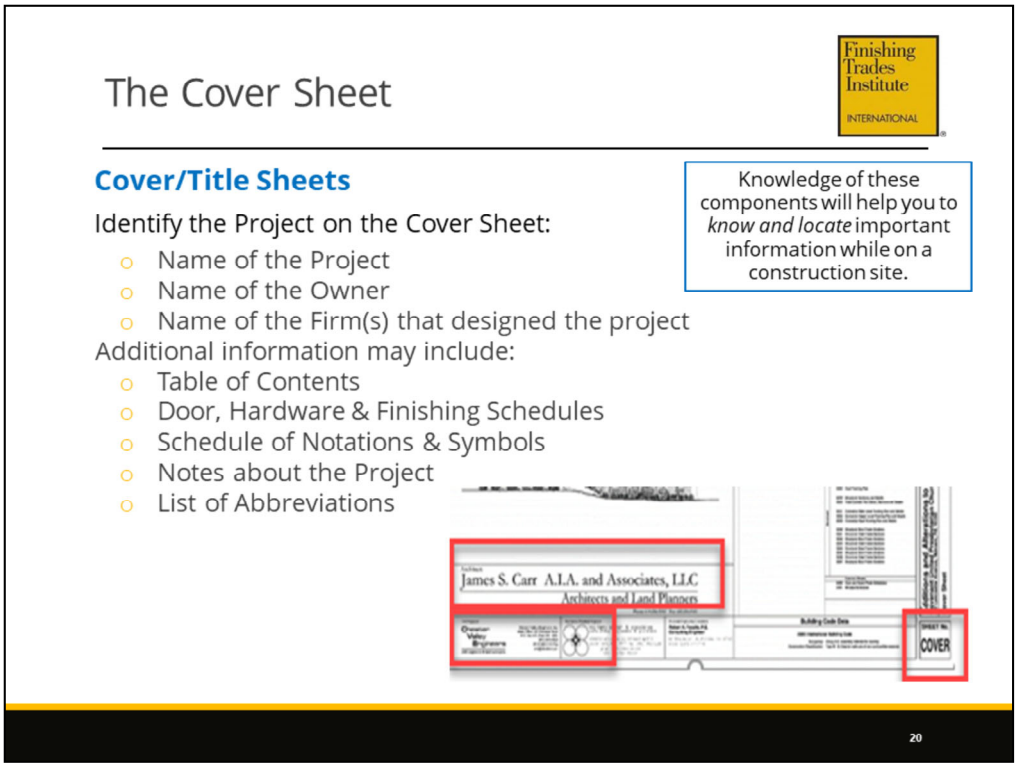
It is important to understand that oftentimes the workers do not see the specifications. It is important to follow the blueprints and read the instructions.

Specifications are detailed written instructions about how the building is to be built.

Plans contain several sheets depending upon the size and complexity of the job.

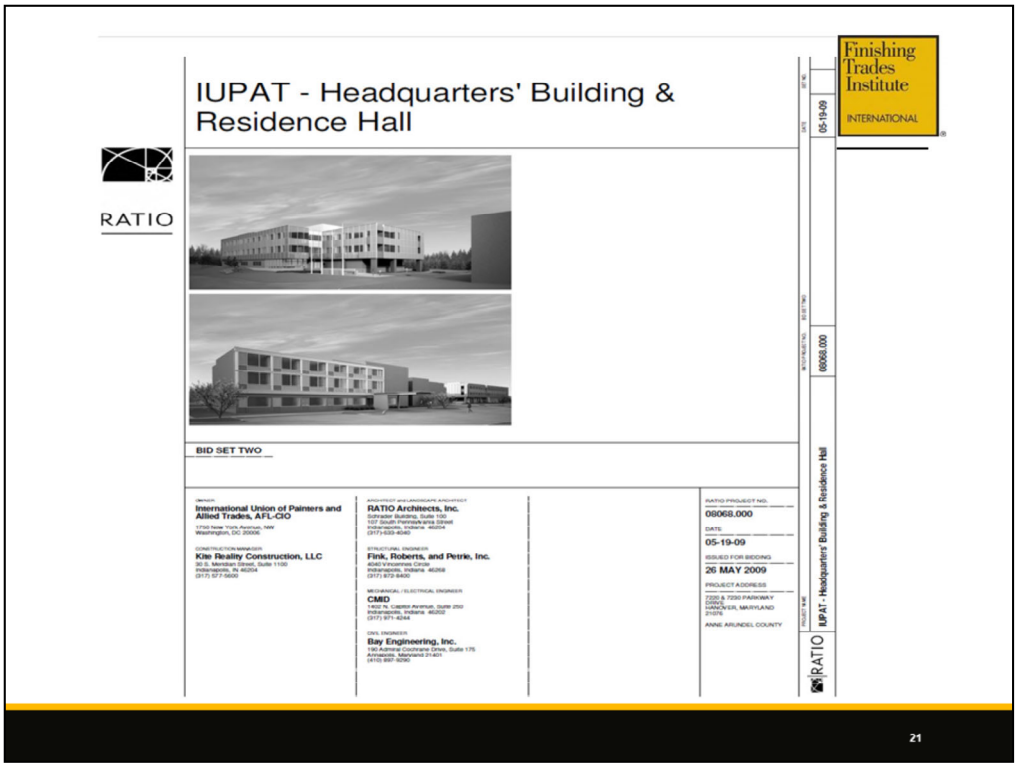
The plans for a large commercial building will be prepared by more than one office, for example, the architect is responsible for the overall design of the building; a structural engineering firm produces the structural drawing; a mechanical engineering firm produces the mechanical drawing, and so on.

The quality standards, for example, will require adherence to the specs which will identify the specific type of materials to be used, for example, the specifications will identify the sink as a Kohler *Langlade Smart Divide Undermount Cast-Iron 33 in. 6-Hole Double Bowl Kitchen Sink in White* - this cannot be substituted without authorization.



Instructor Notes: Introduce the cover /title sheet. See next slide for a full cover page picture. Relate blueprint reading to a Book – it tells a story with the Title, Table of Content or Chapters and contents.

- When learning how to read construction plans, it is essential to understand what is contained within typical construction plans, especially the cover/title sheet which provides a great deal of general information.
- Cover/Title Sheets identify the project with information such as the name of the project, the name of the owner, and the name of the major firms that have designed the project. Additional information may include:
    - Table of contents to display what sheets are in the set and how each sheet is identified
    - Door, hardware and finishing schedules
    - Schedule of notations and symbols used to reference and identify detail drawings
    - List of abbreviations
- Plans range in size depending upon the size and complexity of the job, i.e., smaller jobs will not require as many specialized sheets as a large job.



Instructor Notes: Discuss the cover sheet of this blueprint. Point out the location where each piece of information is found.

- Owner – International Union of Painters and Allied Trades, address
- Construction Manager Name – Kite Reality Construction, LLC, address and phone
- Architect and Landscape Architect – RATIO Architects, Inc. (address and phone)
- Structural Engineer – Fink, Roberts, and Petrie, Inc. (address and phone)
- Mechanical and Electrical Engineer – CMID (address and phone)
- Civil Engineer – Bay Engineering, Inc. (address and phone)

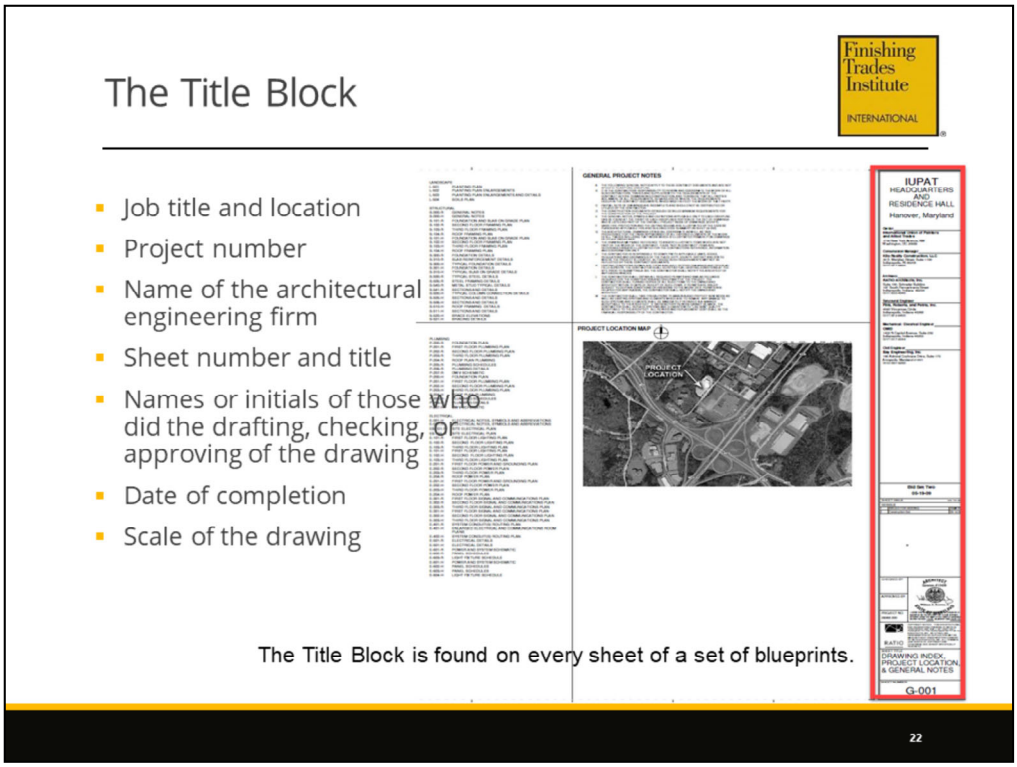
Low Right Corner:

RATIO Project No.

Date

Issued for Bidding date

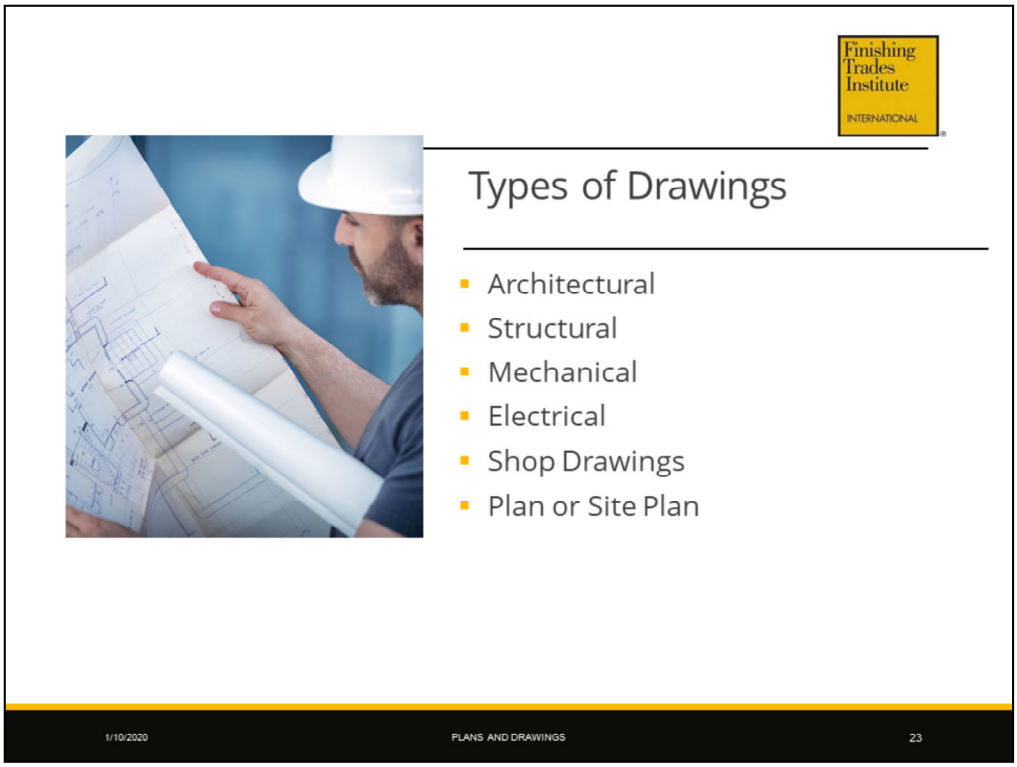
Project Address



Instructor Notes: The title block is a component of the cover/title sheet – ADD HQ picture – architectural stamp – title block on every page of the plans.

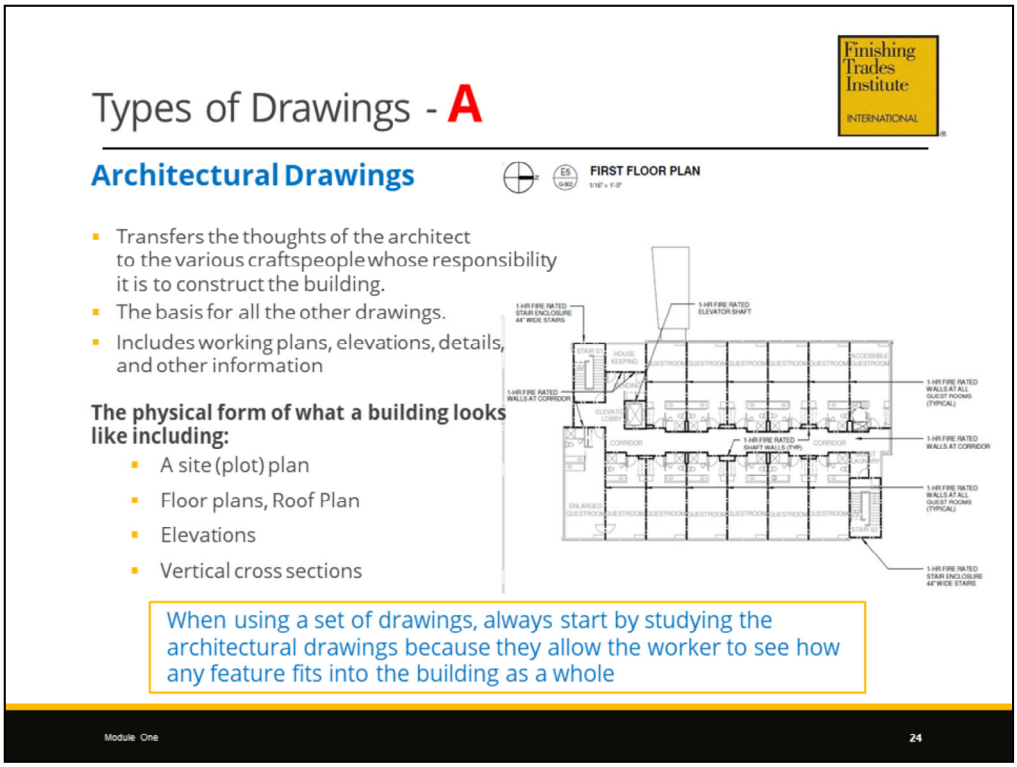
- The title block is typically found on every page of the plans. May be variance in the architectural styles of drawings and general information detail and location/
- The Title Block will identify the:
- Job title and location
- Project number
- Name of the architectural engineering firm
- Sheet number and title
- Names or initials of those who did the drafting, checking, or approving of the drawing
- Date of completion
- Scale of the drawing

The architect's stamp is an important part of the Title Block – insures you are working from the actual plans



Instructor Notes:

Review the different drawing types you will work with on the job.



Instructor Notes: Introduce the importance of the Architectural drawings by emphasizing the points on the slide. Point out that the graphic is a portion of a floor plan.

The architectural drawings are a means of transferring the thoughts of the architect to the various craftspeople whose responsibility it is to construct the building. Architectural drawings are made by an architect for a specific job.

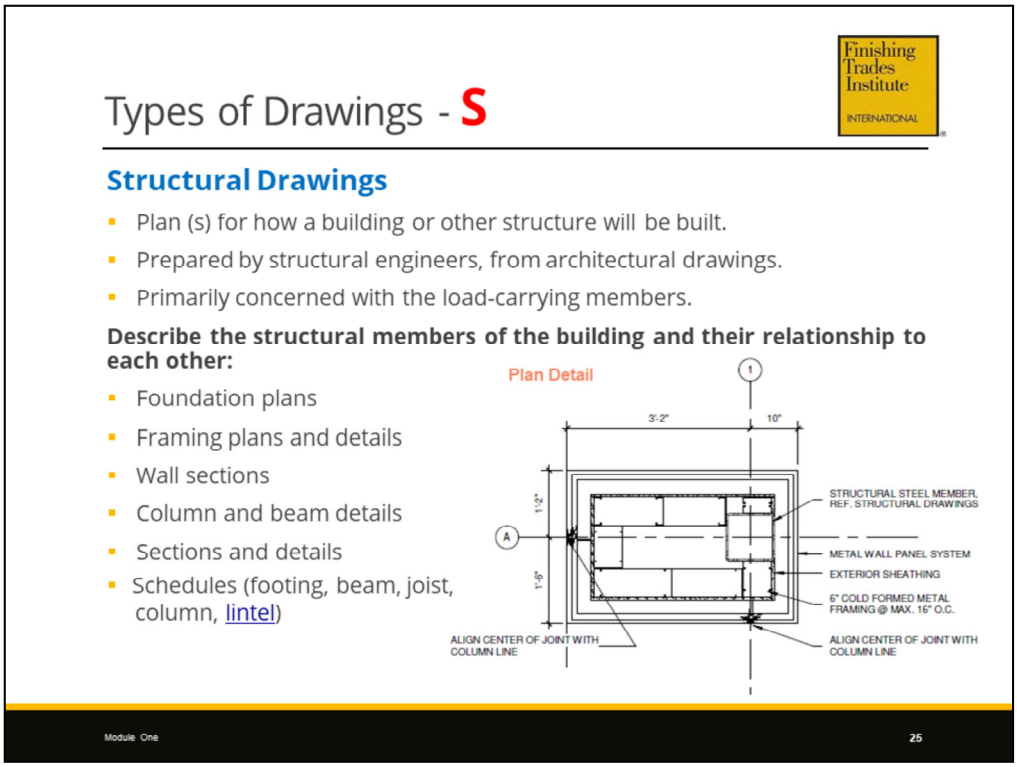
The basis for all the other drawings.

Includes working plans, elevations, details, and other information

Describes the physical form of what a building looks like and what is included:

- A site (plot) plan indicates the location of the building on the property.
- Floor plans show the walls and partitions for each floor or level.
- Elevations of all exterior faces of the building.
- Vertical cross sections show the floor levels and details of the footings, foundations, walls, floors, ceilings, and roof construction.

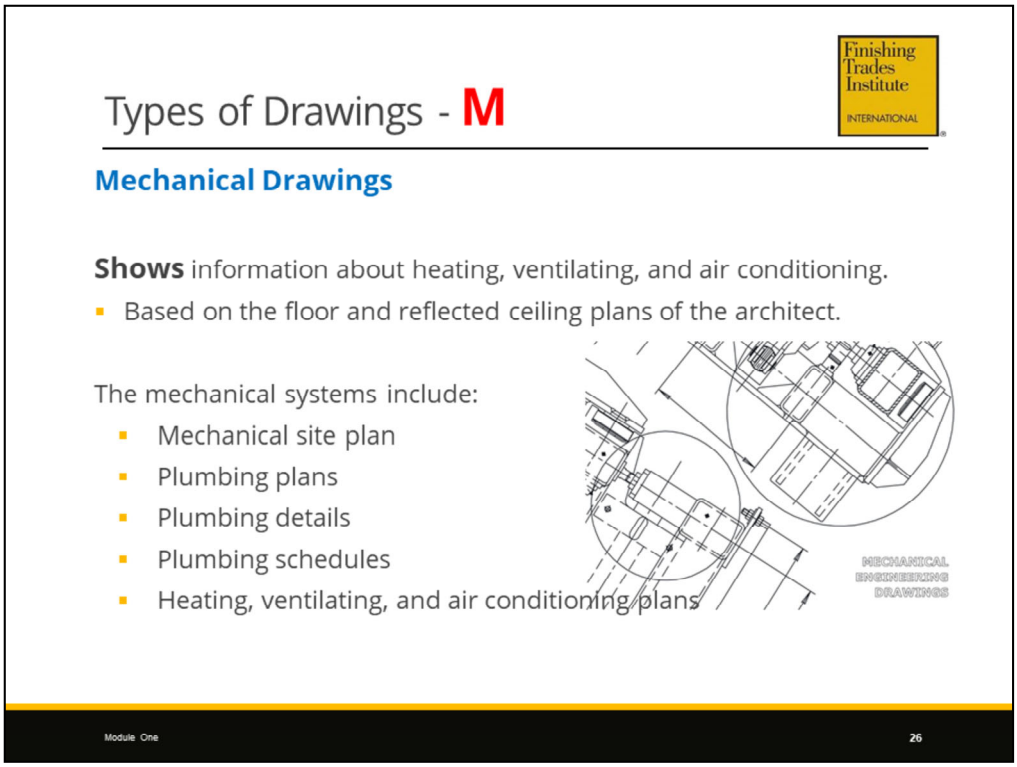
When using a set of drawings, always start by studying the architectural drawings because they allow the worker to see how any feature fits into the building as a whole.



Instructor Notes: Explain that structural drawings are a plan or set of plans for how a building or other structure will be built.
Prepared by registered professional structural engineers, and informed by architectural drawings.

Primarily concerned with the load-carrying members of a structure. Structural drawings show the structure that supports the building. Structural drawings consist of all drawings that describe the structural members of the building and their relationship to each other including:

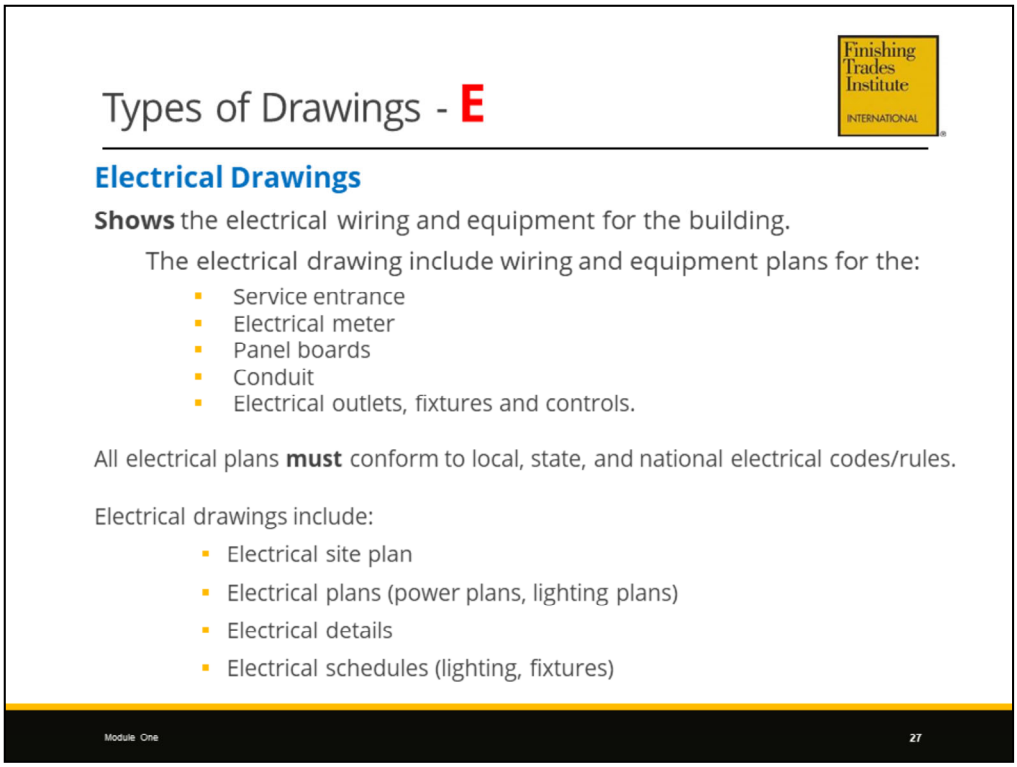
- Foundation plans
- Framing plans and details
- Wall sections
- Column and beam details
- Sections, details, and schedules



Instructor Notes: Explain Mechanical drawings.

Mechanical Drawings show the mechanical systems for the building. These include:

- Mechanical site plan
- Plumbing plans
- Plumbing details
- Plumbing schedules
- Heating, ventilating, and air conditioning plans

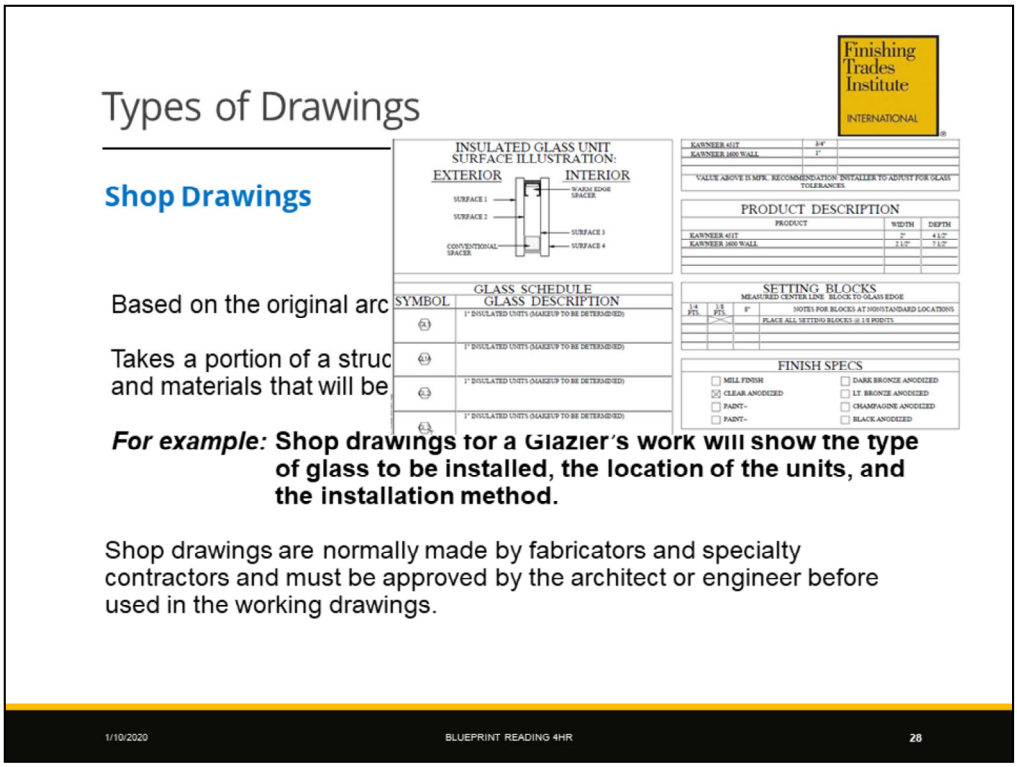


Instructor Notes: Explain Electrical drawings.

Electrical Drawings show the electrical wiring and equipment such as the service entrance, electrical meter, panel boards, conduit, and all electrical outlets, fixtures, and controls. All electrical plans must conform to requirements of the local, state, and national electrical codes and rules. Electrical drawings include:

- Mechanical site plan
- Plumbing plans
- Plumbing details
- Plumbing schedules
- Heating, ventilating, and air conditioning plans

Electrical schedules (lighting, fixtures)

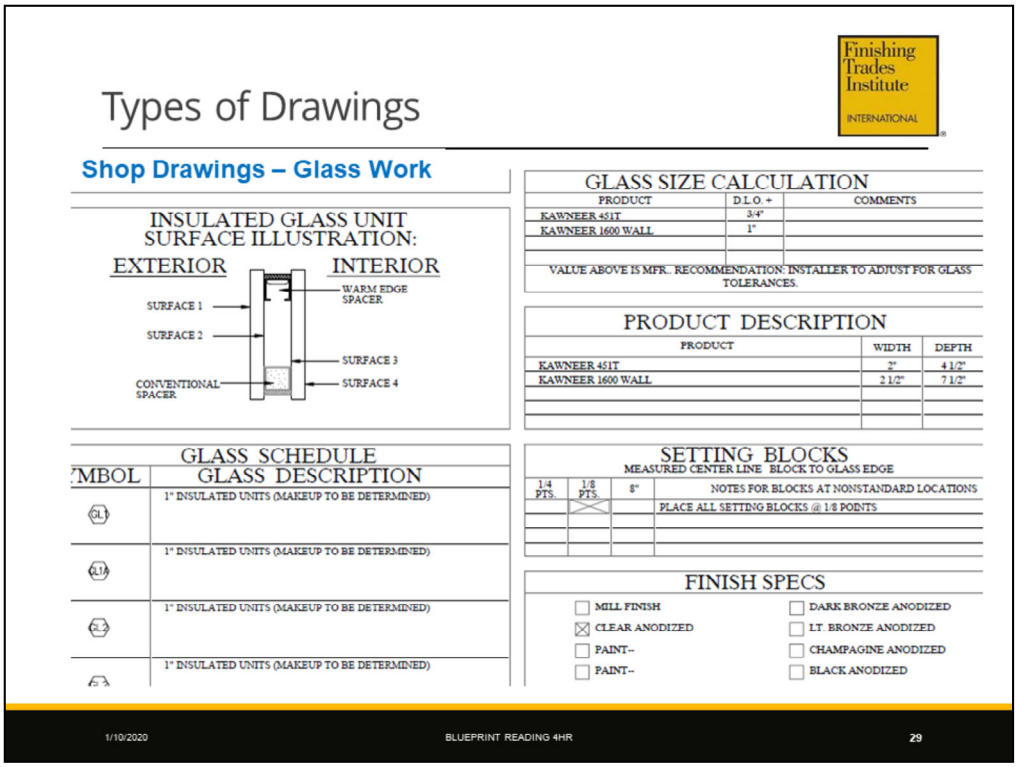


Instructor Notes: Discuss what shop drawings are, and how they are used.

Shop drawings are based on the original architectural plans.

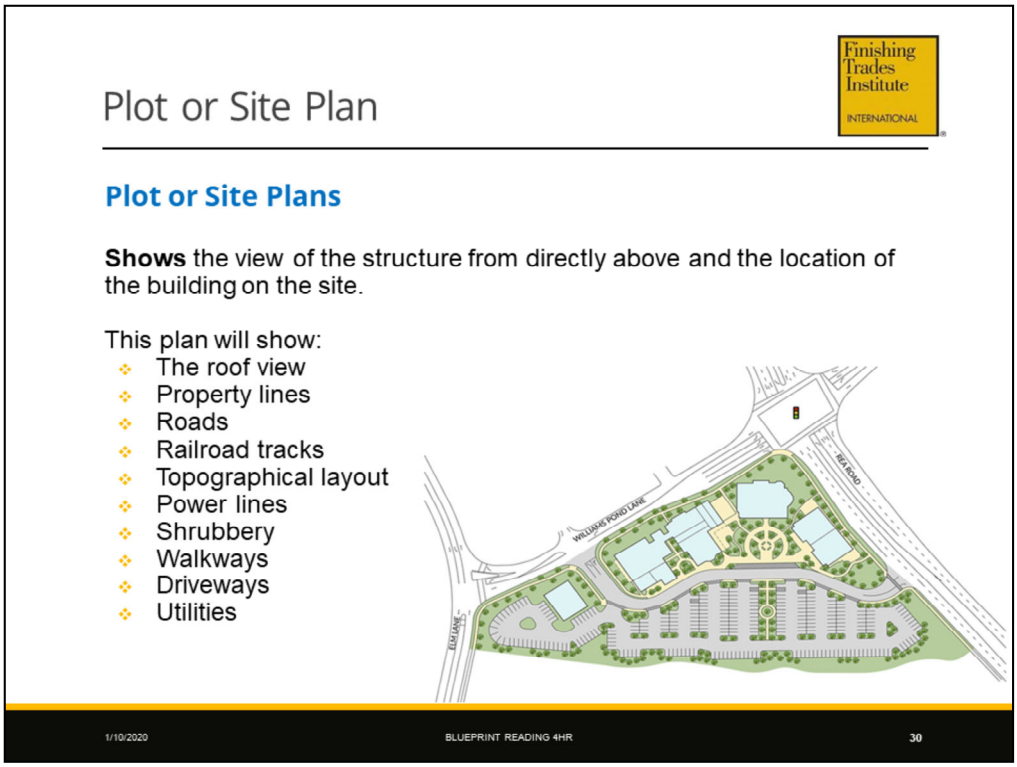
A shop drawing takes a portion of a structure and details the exact design, dimension, and materials that will be used by a specific trade. For example, shop drawings prepared specifically for the glazing trade's use will show the type of glass to be installed, the location of the units, the installation method, and any other pertinent information.

Shop drawings are normally made by fabricators and specialty contractors. After review and approval by the architect/engineer they become a part of the working drawings.



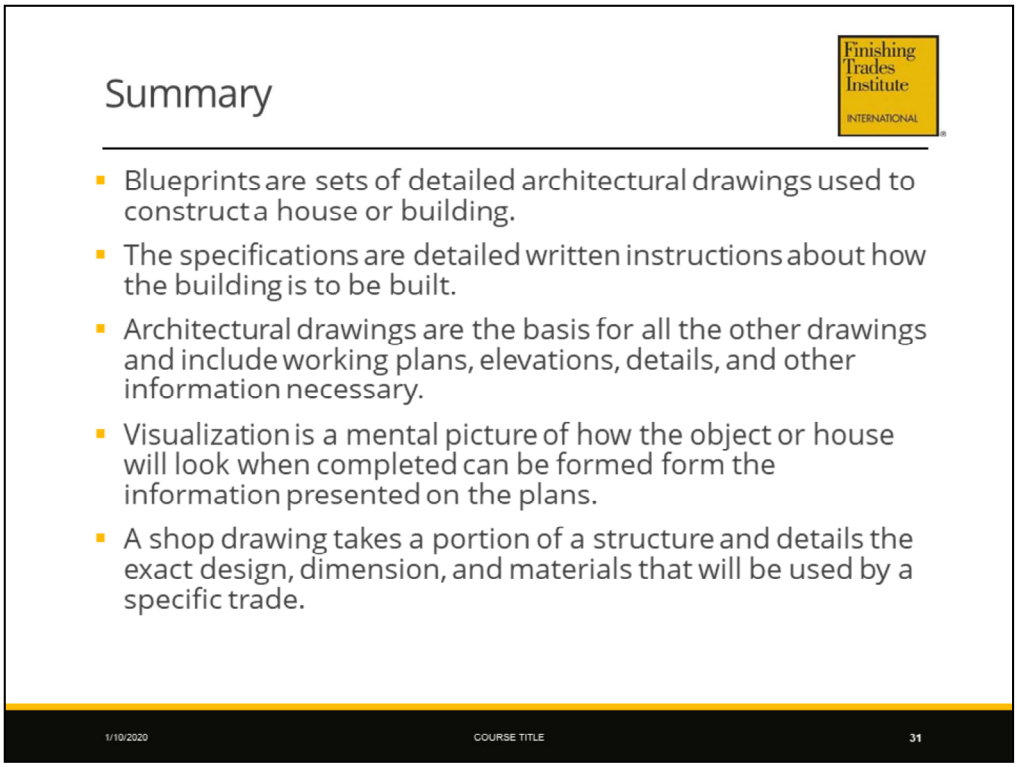
Instructor Notes: Discuss this portion as an example of a shop drawing that details the glass used in this project.

As a worker you will be required to read shop drawings. You must be able to complete a job using shop drawing information.

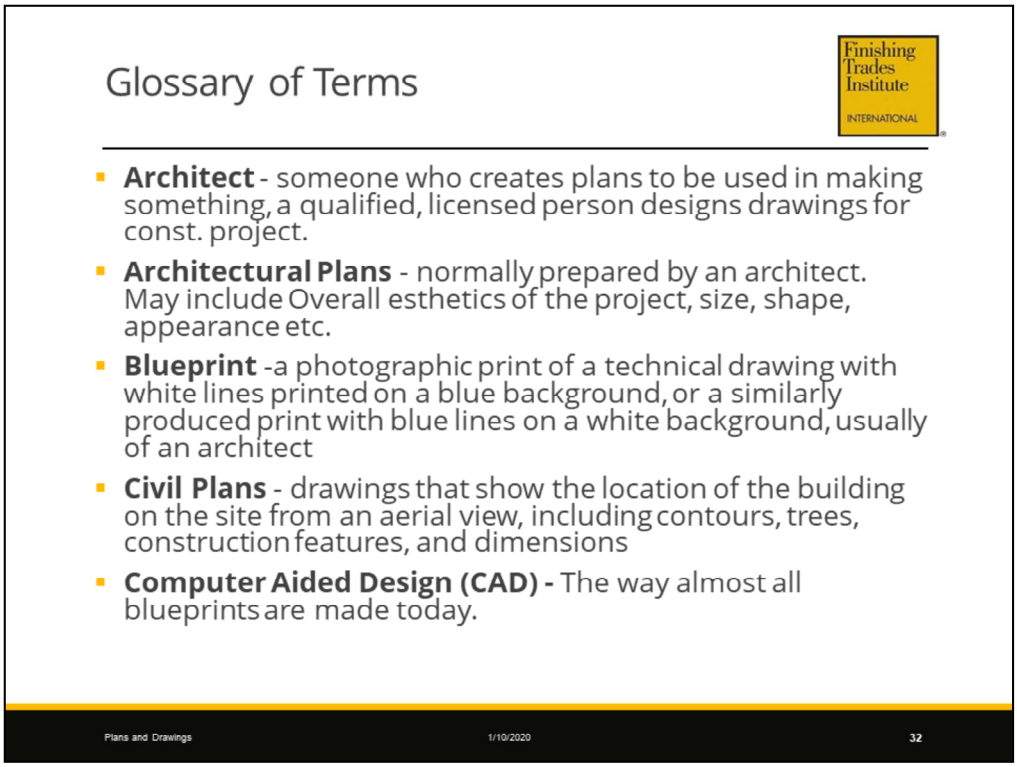


Instructor Notes: Instructor Notes: Highlight that the purpose of the plot plan is to show how the structure fits on the property, the distance to the property lines, the building setback requirements and relationships to any easements or other property encumbrances.

The plot or site plan is the view of the structure from directly above. This plan will show the location of the building on the site as well as the roof view, property lines, roads, railroad tracks, the topographical layout, power lines, shrubbery, walkways, driveways, and utilities. The plot or site plan will also include an area location map, demolition plan, excavation plan, utilities plan, grading plan, and landscaping plan.



Instructor Notes: Review these and other points as needed.



Instructor Note: Tell students that this glossary of terms highlights some of the terms and concepts provided in this module. These are also found in the Student copy of the presentation.

Glossary of Terms

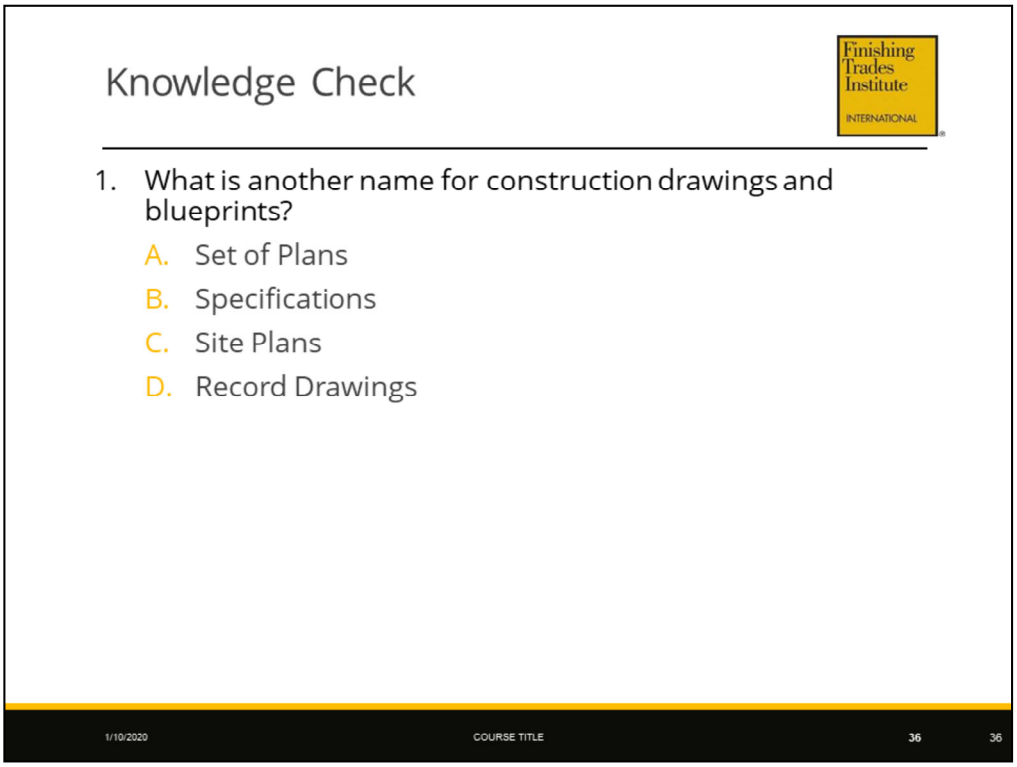
- **Contract Documents** - Used to describe all of the documents needed to build a project. Typically these include the plans, specifications, general conditions and the contract for construction.
- **Detail Drawing** - enlarged views of some special features of a building, such as floors and walls.
- **Dimensions** - The actual measurement of an object. It can measure to the exterior or the interior portion
- **Electrical plans** - engineered drawings that show all electrical supply and distribution locations of electric meter, switchgear.
- **Engineer** - A person that applies scientific principles in design and construction.
- **Floor Plan** - An actual view of the layout of each room.

Glossary of Terms

- **Foundation Plan** - Shows the lowest level of the building.
- **Legend** - Defines the symbols used in architectural plans
- **Mechanical Plans** - Are engineered plans for motors, pumps, piping systems, and piping equipment.
- **Plumbing** - Refers to both water supply and all liquid waste.
- **Plumbing plans** - Shows the layout for the plumbing system that supplies hot and cold water, for the sewage.
- **Roof Plan** - Shows the shape of the roof and the materials that will be used to finish it.
- **Scale** - tells the size of the object drawn compared with the actual size of the object.

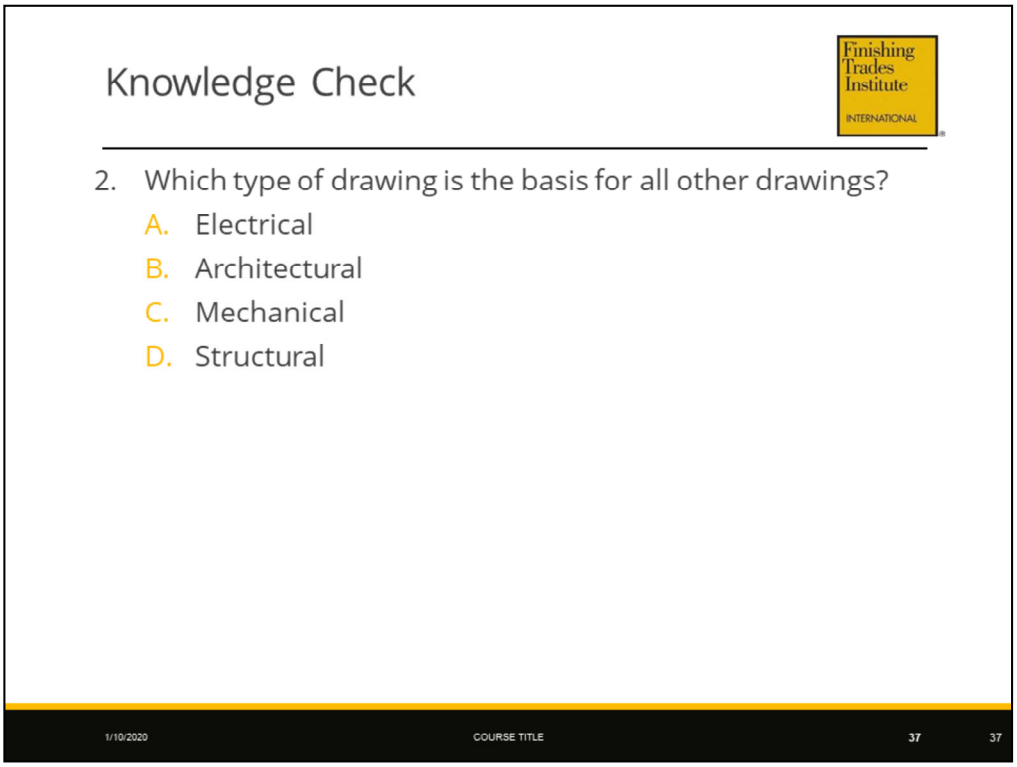
Glossary of Terms

- Specifications - Written statement provided by the architectural and engineering firm to define the quality of work to be done.
- Structural Plans - Used to support the architectural design, include the general notes, a foundation plan.
- Title Block - Gives info about the structure and is numbered for easy filling.



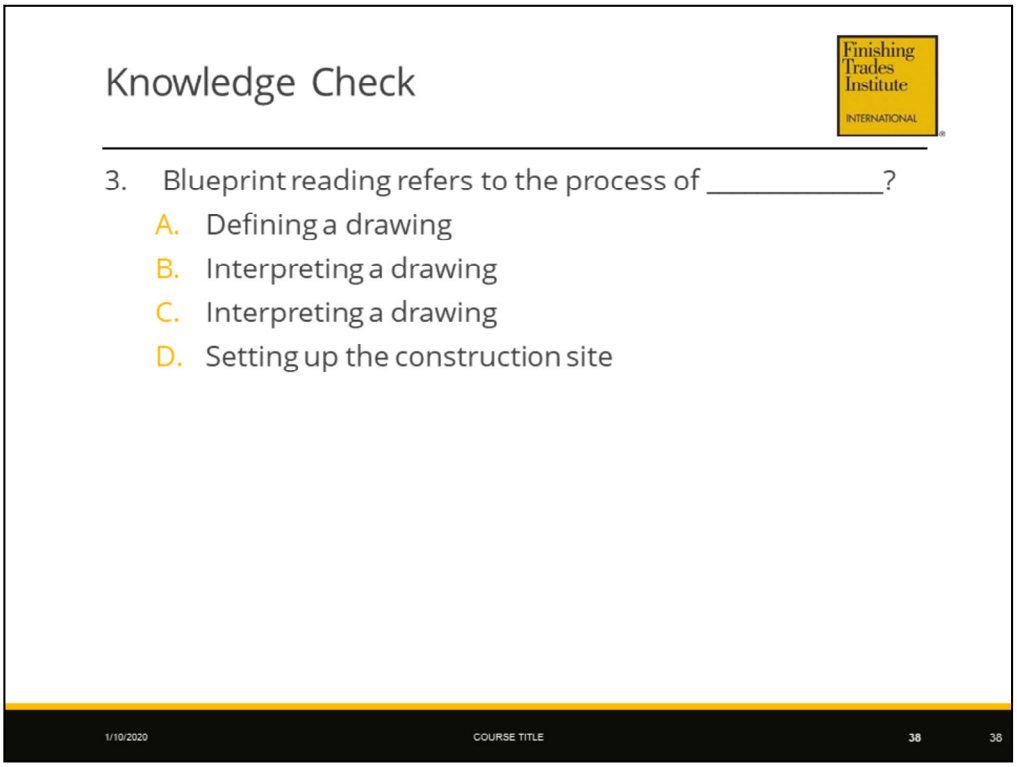
Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is A. Set of Plans.



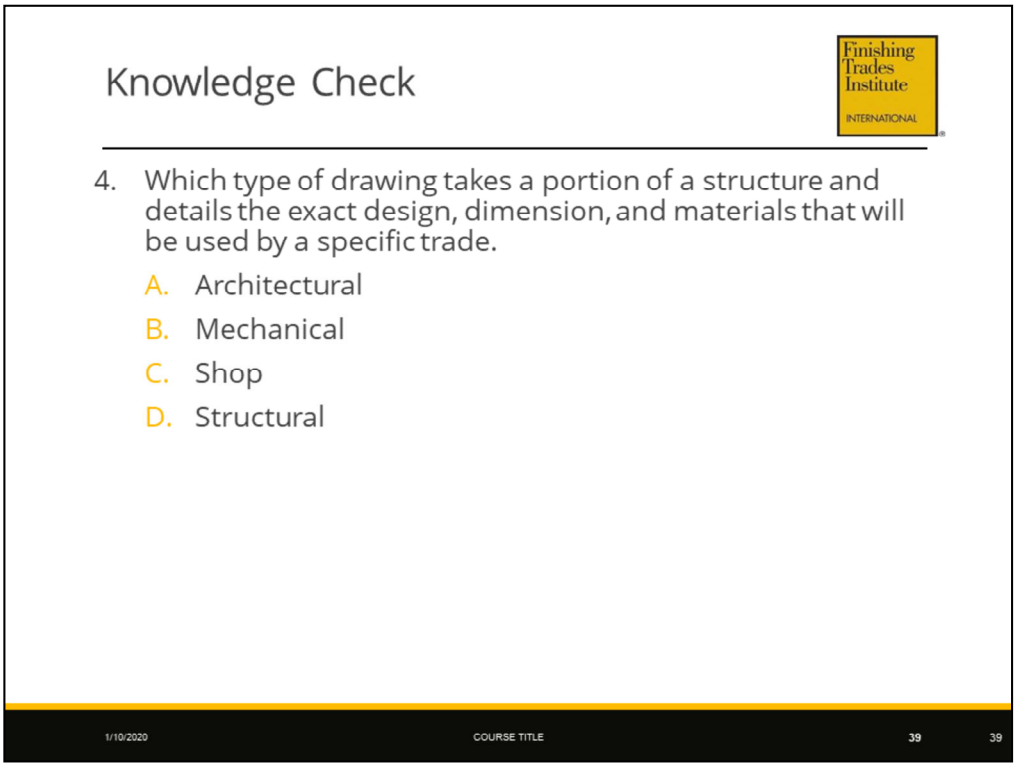
Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is B. Architectural drawing.



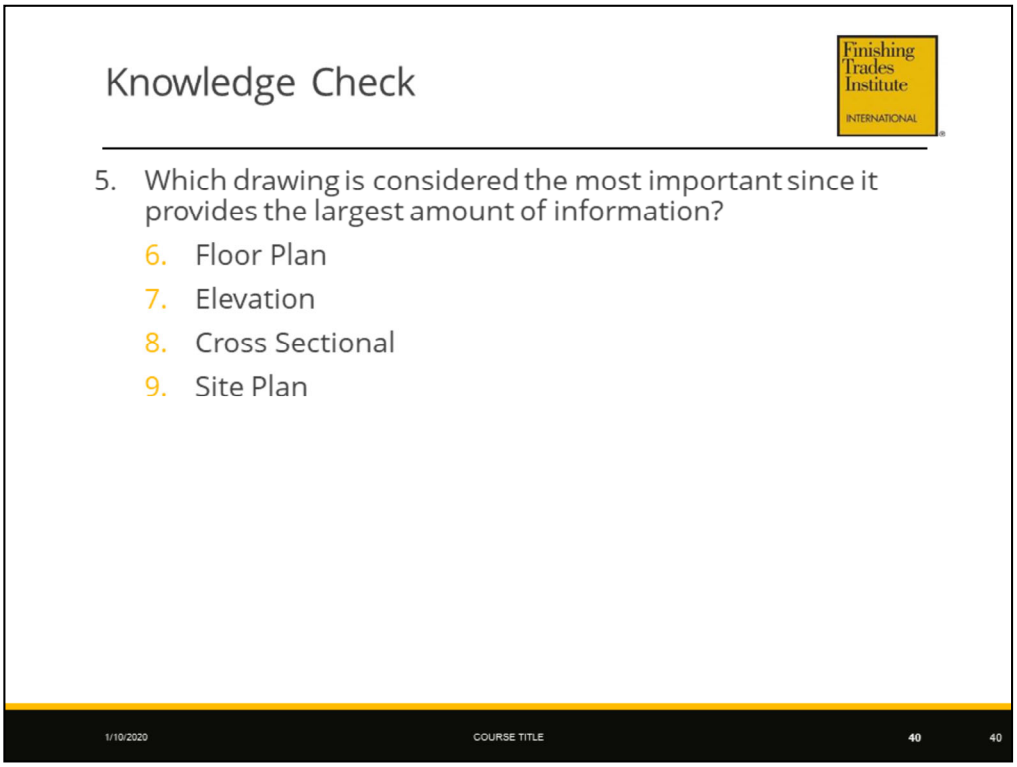
Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is C. Interpreting a drawing.



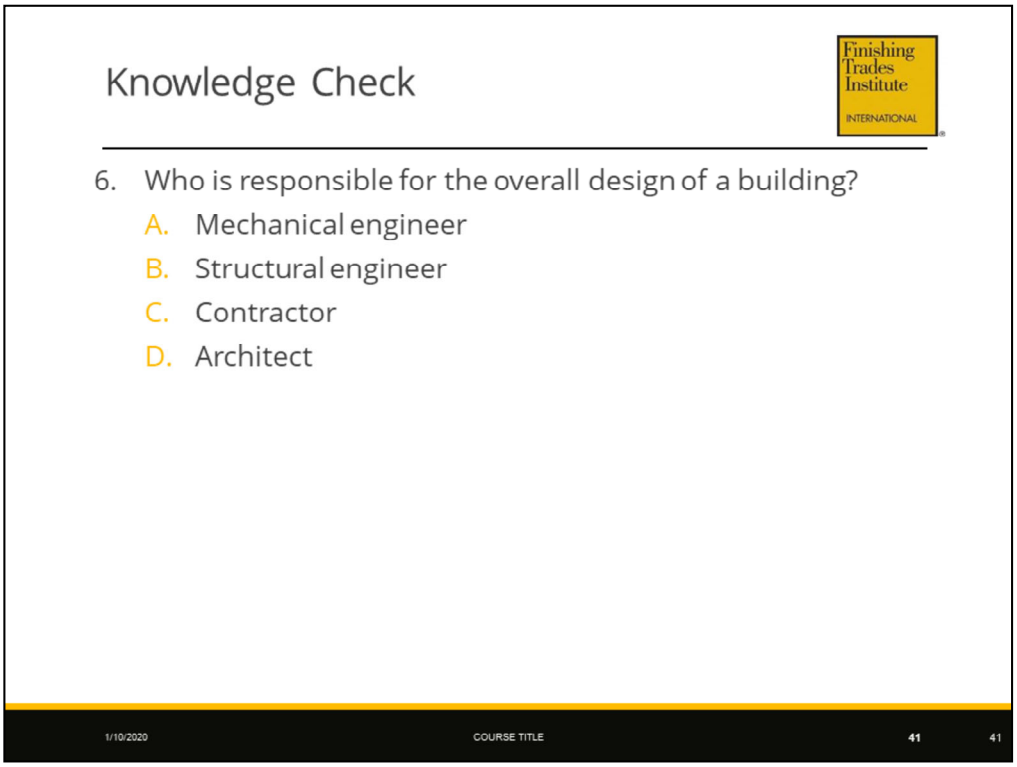
Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is C. Shop Drawings.



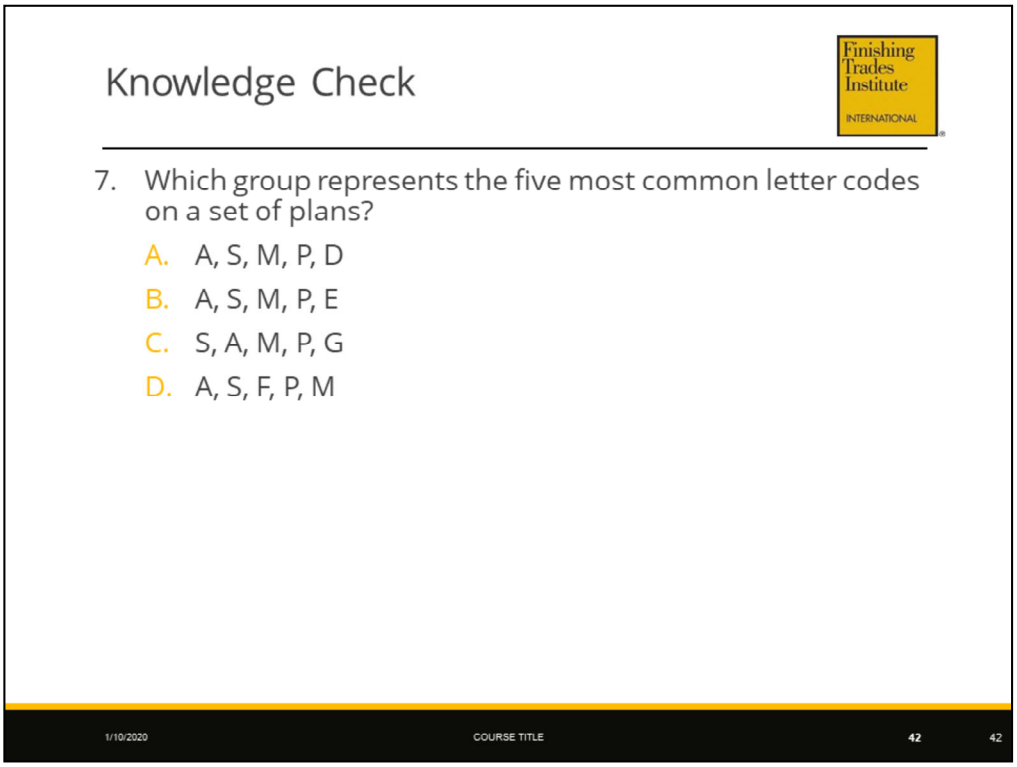
Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is A. The Floor Plan provides the largest amount of information.



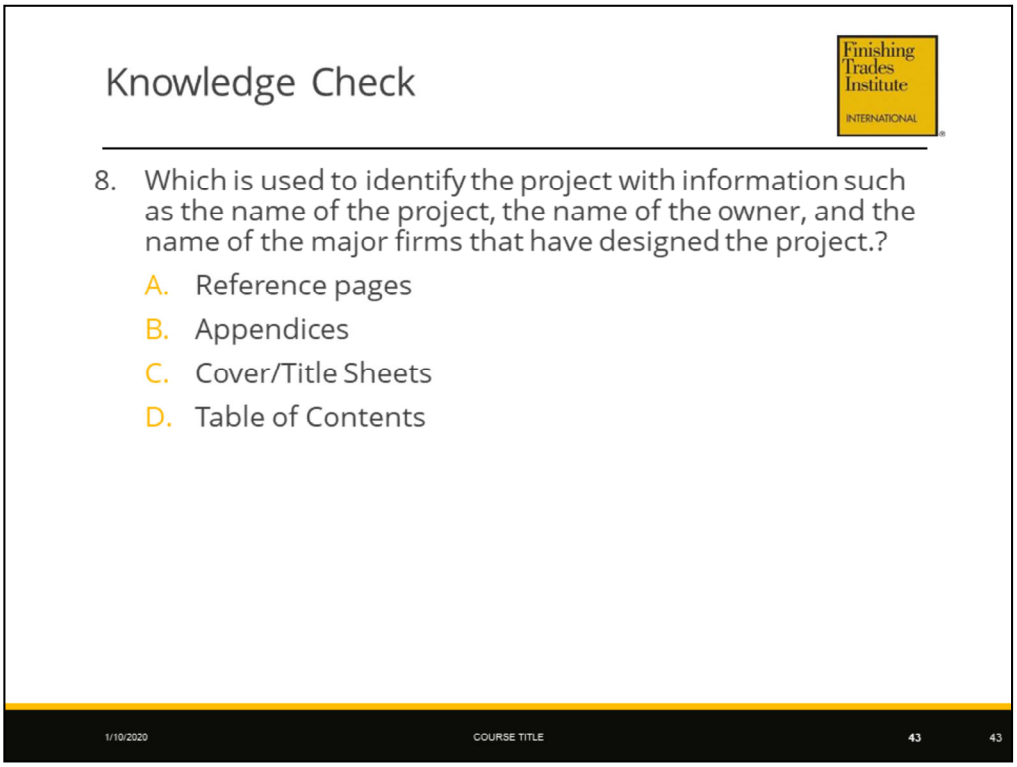
Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is D. The architect is responsible for the overall design of a building.



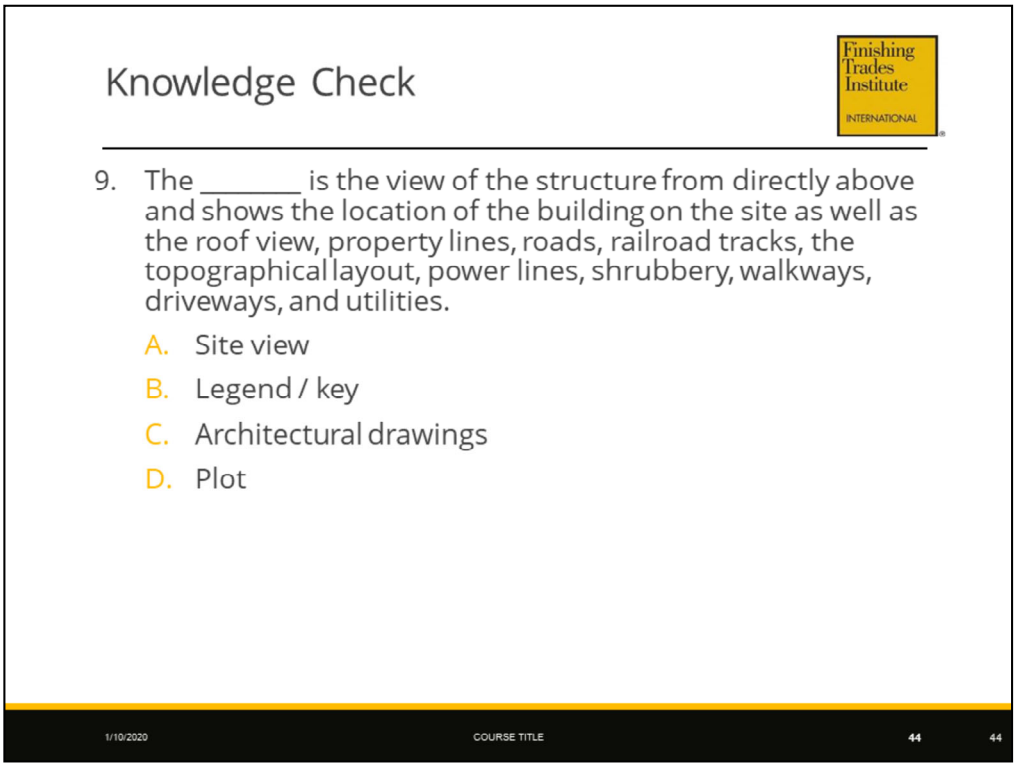
Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is B. A, S, M, P, E - Architectural, Structural, Mechanical, Plumbing, and Electrical



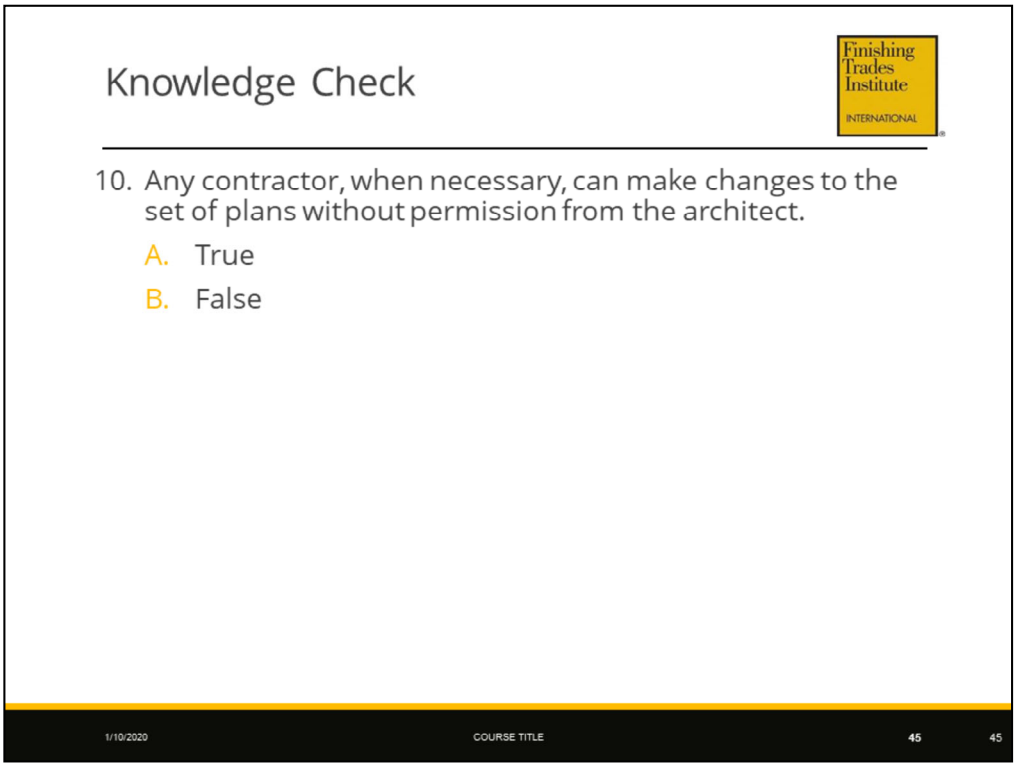
Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is C. Cover/Title Sheets



Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is D. Plot



Instructor Notes: Instructor may use this knowledge check in class/as a class (ask the question, elicit responses, then scroll to reveal answer.

The correct answer is B. False. The architect is the only one that can make changes to the plans.

End of Training

Congratulations! You have successfully completed the introductory module of the Blueprint Reading Principles course.