

**Construction**

**Blueprint**

**Reading 1**

**Unit #106**

## INTRODUCTION

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The best way to learn how to read blueprints is to practice. It is not something that you will learn overnight or the next two nights. In the previous chapters we have learned the function of the numerous symbols and lines. We have also learned how the different views (section, elevation, plan, detail) relate to blueprints. You have also learned how to locate the different views within a set of prints.

So how do you put it all together? One of the best ways to find an answer to a question is to ask yourself: “Where would I probably find the answer to this question?” For example: What on center framing 16” or 24” is required for this wall? Well, there could be a couple of places to locate this information. I would first start with the wall legend on the floor plan, it usually gives a description for each wall to be built and sometimes will reference you to a detail. If the wall legend was not very helpful, then you may want to locate a cutting plane or section callout on the floor plan for this particular wall. From the sectional you would find the components used for this wall and directions for their installation. You will eventually find the answer and from practice it will become easier, because you will have been around the block a couple of times, as they like to say.

**Notes:**

# Chapter 1 Introduction to Construction Blueprint Reading

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**Objectives:** At the end of this chapter, students will be able to:

- 1). Understand how a set of construction drawings is organized.
- 2). Recognize the various types of plans contained in a set of blueprints.
- 3). Determine how different views of a construction project, when shown in a set of prints, are used to gather information.
- 4). Properly care for a set of blueprints.

## Introduction

Before a building is built, someone must determine the specific needs for a building. Whether it is a school, hospital, house or a commercial building, the owner hires an architect to design a building with the needs of the end user in mind. The architect then relates these needs to the builders in the form of a set of blueprints or sometimes called “working drawings”.

The blueprints or working drawings define the scope of work to be performed for each trade involved in the building. A set of “specifications” is also written to further define the scope of work and what materials are to be used. Builders use the blueprints and specifications together to gain a clear understanding of the construction project.

A blueprint is a copy of a drawing, which shows how a building is to appear when it is finished. The architect or engineer will have the original drawings on file for any changes, which may need to be performed. The term blueprint was originally used because when copies were made, the background was blue, and the lines drawn were white. Today’s drawings are white background and dark lines.

## Organization of Construction Blueprints

Each set of blueprints and their specifications refer to a particular building, however there are many views, symbols, abbreviations, lines and kinds of drawings that are common to all blueprints. A set of prints is usually organized into sections as to the sequence of construction. Listed below are some common sections of a set of prints and the particular plans they may contain. Keep in mind not all sets of prints will contain every section or plan listed below if the building project does not require it, for example, a remodel.

- **S - Structural.** Foundation Plan, Columns, Concrete, Wood and Metal Stud Load Bearing Structures
- **A -Architectural.** Index Sheet, Plot/Site Plan, Floor Plan, Reflected Ceiling Plan, Elevations, Sections and Details.
- **E – Electrical.** Power Plan, Lighting Plan
- **M – Mechanical.** Heating and Cooling Plan, Ventilation Plan.

Depending on the complexity of the project, the architect and engineer may use additional sections:

- **L – Landscaping.** Irrigation Plan, Planting Plan.
- **FS – Fire Sprinkler.** Riser and Piping Plan.
- **P – Plumbing.** Water supply and waste systems.

## **Types of Prints**

Within the sections of a set of blueprints, architectural, structural, electrical and mechanical, you will find many different types of prints. Some architects will usually use the letter classification of the section when numbering each sheet or print. For example, A-1, A-2, etc. would be used for the prints within the architectural section, M-1, M-2, etc. for mechanical and so forth. Sometimes architects simply number the sheets of the set and use no letter classification.

The architectural section will include a floor plan, elevations, sections, reflected ceiling plan, details, door and window schedules. The drywall/lather will spend most of their time gathering information from these prints within the architectural section.

Listed below are some of the prints found in the drawings. Each drawing in a set of blueprints are identified as to what sheet number it is and should have a heading such as “Floor Plan”, “Reflected Ceiling Plan”, “Elevations”, etc.

Working drawings show all walls, partitions and other features of a building by means of lines, symbols and conventional representations. However, information is shown on the prints in the form of notations. Written information is shown on prints in these ways:

- Descriptive titles are placed near a specific item and connected with a leader line terminated by an arrowhead or a dot.
- Specific information that refers to only one situation may be placed near the situation.
- General information applying to several sheets in the prints may be placed in any convenient space, usually the index sheet.

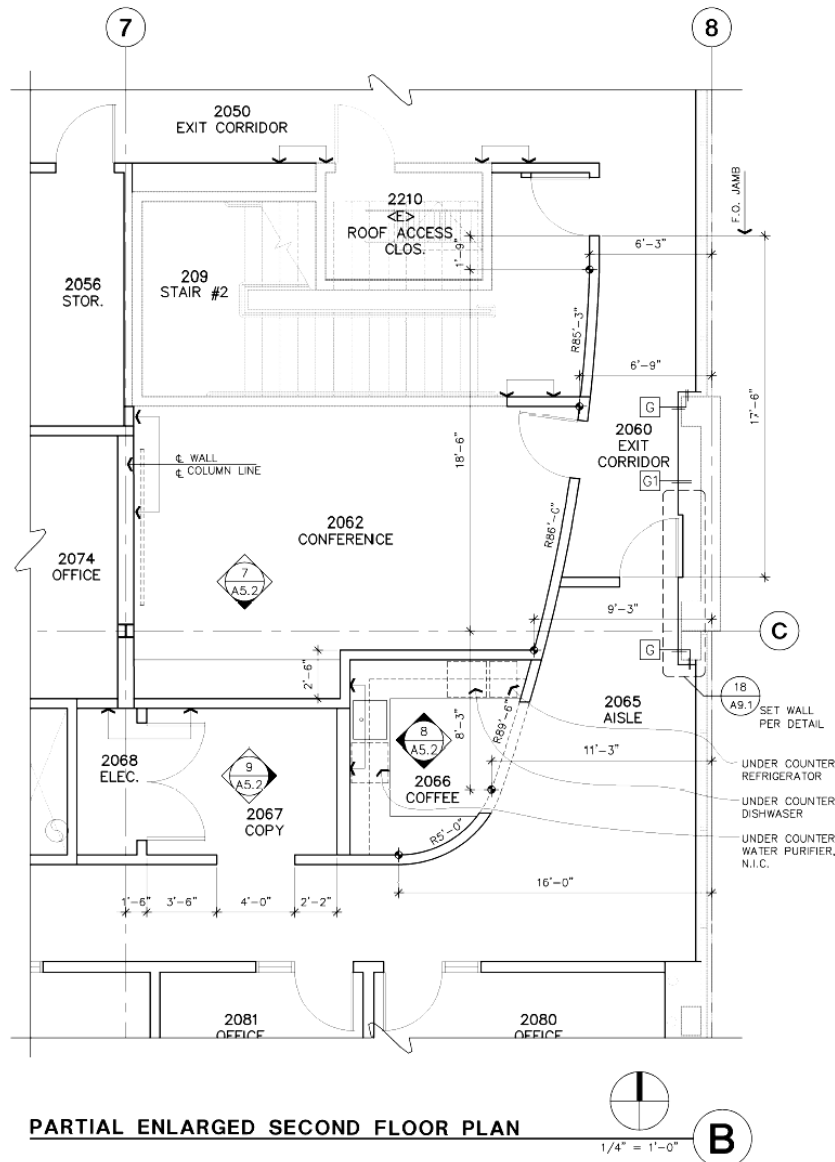
## **Index Sheet**

The index sheet contains the architects’ name, along with any engineers and consultants used on the project. Also found on the index sheet will be the location map of the project, name of the project, an index list of the drawings, a list of abbreviations used in the prints, an explanation of the plan symbols used, title block and a revision area. Most importantly, a general notes section pertaining to the entire project, which should be read thoroughly. Within these notes, you will usually find information about the dimensions, whether they are frame-to-frame, center-to-center or finish-to-finish.

## Floor Plan

The floor plan is an important drawing because it contains the most information. Imagine you are standing about four feet above the floor and looking down on the entire building what would you see? You would see the location of columns, the arrangement of interior and exterior walls, doors and windows, duct shafts, stairways and built-in cabinets, should they be included in the construction. Along with these items would be the dimensions for layout and usually a partition legend describing the construction of the partitions shown on that particular floor plan, along with any sheet notes. Remember a floor plan is a plan view because you are looking down.

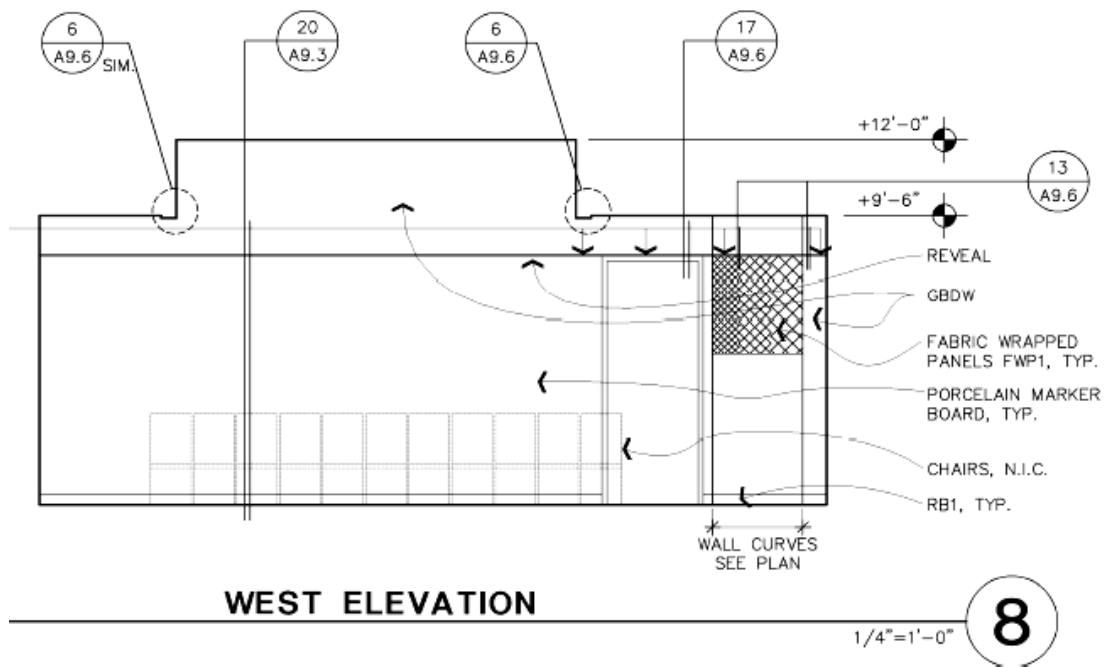
The floor plan is used to direct the drywall/lather to other drawings contained in the blueprints using elevation, detail and cutting plan symbols as shown on the partial floor plan below. High-rise buildings will have a separate floor plan for each floor.



## Elevations

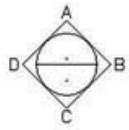
Elevation views can be for the exterior and interior portions of the building. Studying the elevation drawings gives you a working idea of the appearance and layout of the structure. Usually four views are shown and may be designated as Front, Rear, Right Side and Left Side; however, it is more common to refer to them by the geographic direction each side of the building is facing, such as North, South, East and West. Instead of looking down as in a plan view, you are facing the object and looking directly at the object for all elevation views. Elevation symbols will direct you to the referenced sheet and elevation views are useful for finding the wall surface materials and particularly the height of objects. Elevation views are drawn as a finished product or how it should look upon completion.

In the elevation shown below, note the wall surfaces will consist of gypsum board drywall, fabric wrapped panels, along with a porcelain marker board on the West wall. The finished heights of the soffits and ceilings are shown in addition to detail and section callouts. The wall reveal is found on this elevation, as it is not referenced on the floor plan.

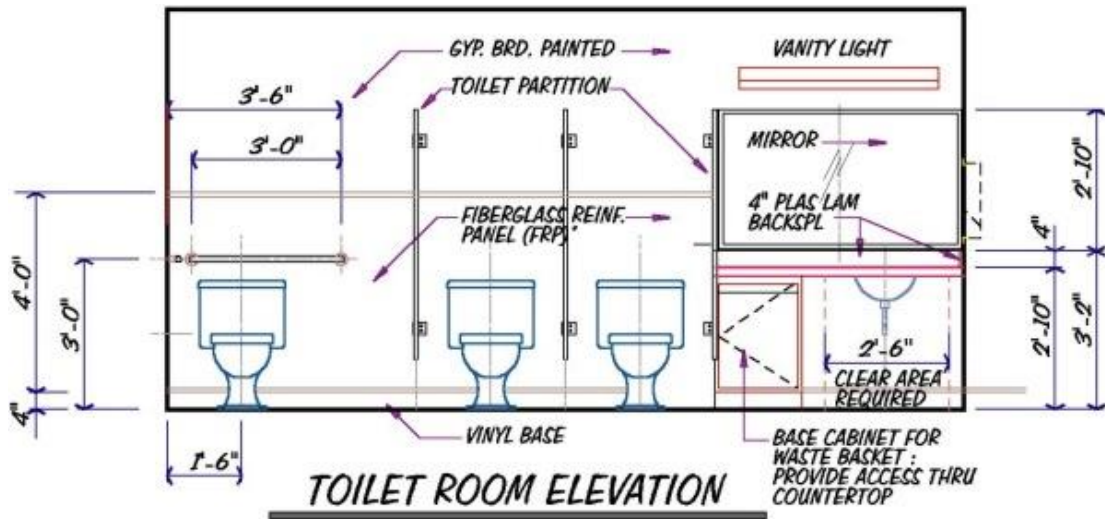


When elevations are used to show the inside of a room, these are called interior elevations, as shown below. The heavy horizontal lines represent the floor and ceiling and the heavy vertical lines represent the inside corners. The grab bars are mounted 3'-0" above the floor. The top of the sink counter is 2'-10" above the floor, with a 4" backsplash above the counter.

The wall materials are FRP, with a vinyl base and painted gypsum board. On the right side of the elevation, there is a recessed fixture as shown by the hidden lines. Hidden lines will be discussed in a later chapter.



Symbol used for Interior Elevations

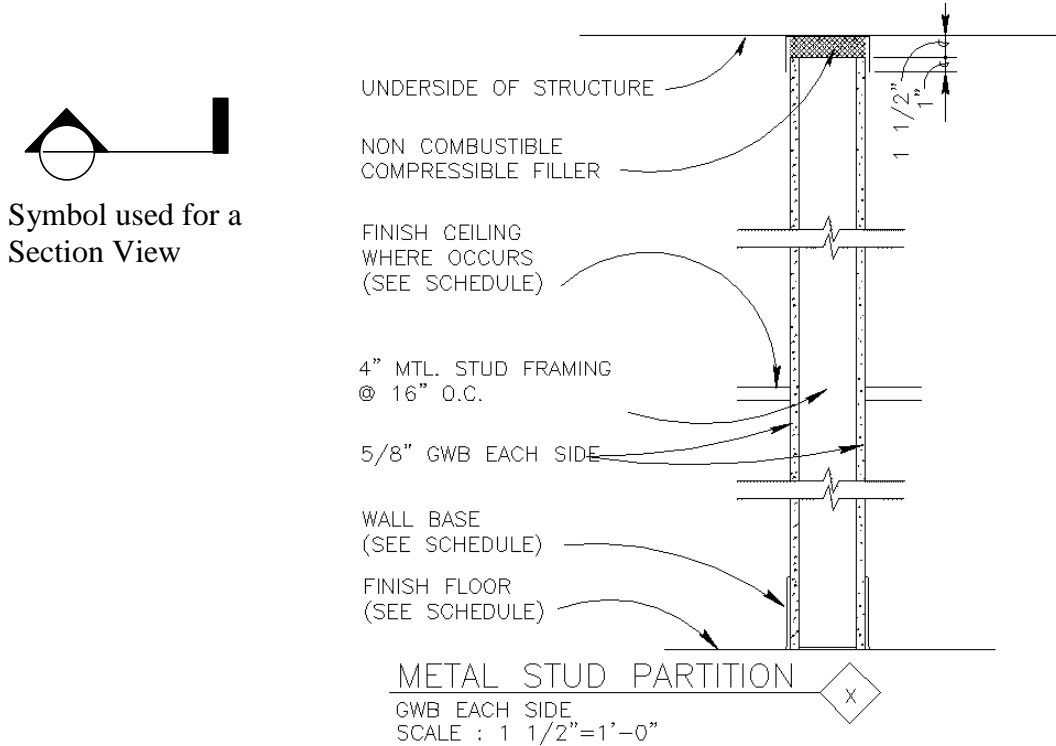


### Sections

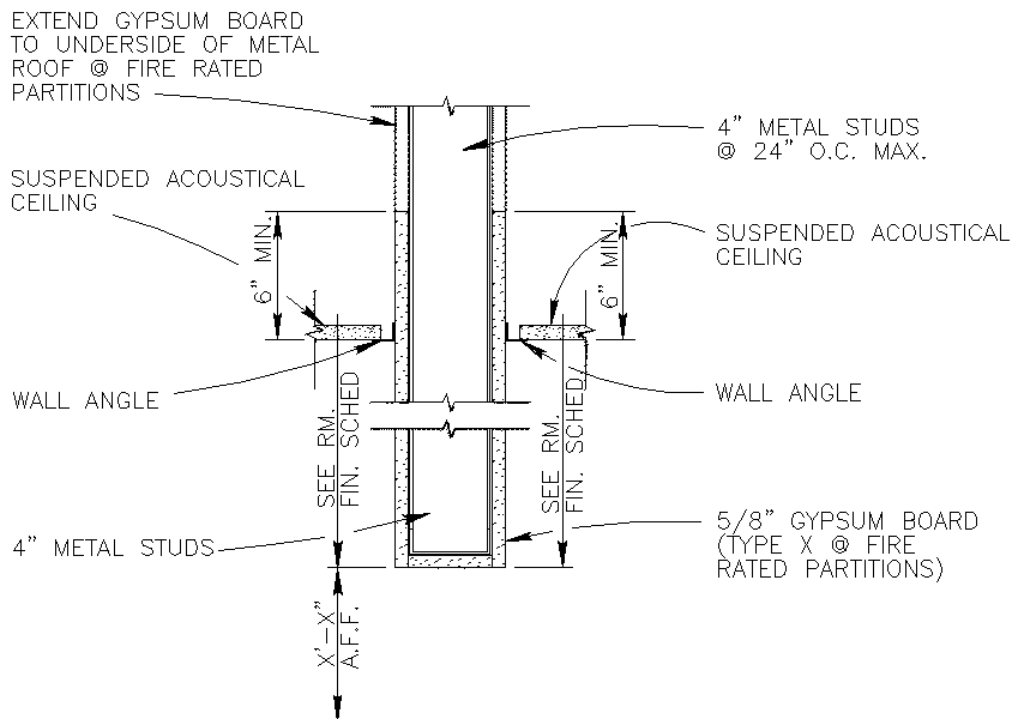
Sections are referred to as “cut” views. If you were to make a perpendicular cut through a wall for example, you would be able to see all of the major components used in the construction, 3 5/8” metal stud, 5/8” sheetrock on each side and R-11 insulation. Sectional views provide important information about height, materials, fastening and support systems, along with concealed features of a structure. Section views are customarily drawn to a larger scale than floor plans or elevations, unless it is a section view through the entire building. This aids in the reading and provides information that cannot be given on elevation or plan views. Typical sections represent the average condition throughout a structure and are used when construction features are repeated many times. Sectional views taken through the narrow width of an entire building are called the transverse sections. Those through the long dimension are known as the longitudinal sections. Cutting plane symbols will direct you to the specific section and sheet.



Below is a typical wall section, which would require 4" metal studs at 16" on center and 5/8" gypsum wallboard each side to within 1 1/2" of the structure above. Being able to find the section when referenced is important, but understanding the information given is important to construct the item properly.



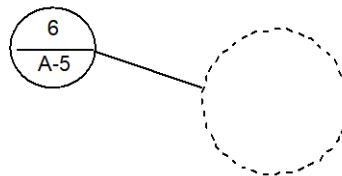
In the section below, the soffit framing is 4" metal studs at 24" o.c. If the situation called for a fire rated soffit, you would need to extend the gypsum board to the underside of the metal roof as noted, otherwise the board is only to go 6" above the suspended acoustical ceilings. The heights of the acoustical ceilings are not shown, but you should refer to the Room Finish Schedule for the height information as noted in the section view.



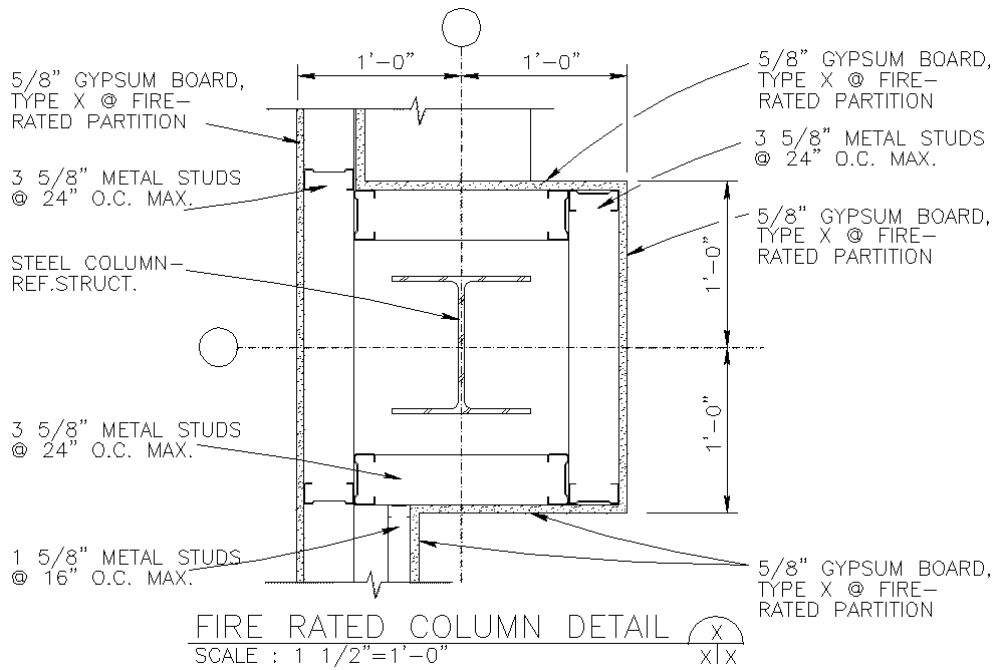
**Details**

Details are provided where special or unusual construction is to be performed. Details are drawn to a larger scale, expanding the feature, allowing the drywall/lather to see the materials used and the methods of attachment for this particular feature. Although details do not use the cutting plane indication, they are closely related to sections. Detail drawings are used whenever the information provided in elevations, plans and sections is not clear enough for the drywall/lather on the job. If an item is important enough to detail, it is important enough to build properly. These drawings are usually grouped so that references may be made easily from the general drawing. Detail callouts will direct you to the specific detail and sheet.

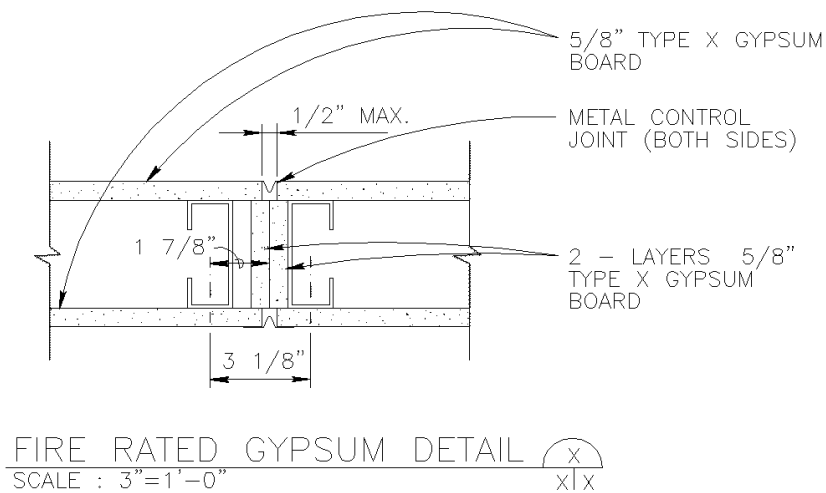
Symbol used for a Detail



In the detail below, you would use 3 5/8" metal studs at 24" o.c. for the column framing, 1 5/8" metal studs at 16" o.c. for additional furring and install 5/8" gypsum board. Note the dimensions given are to finished surfaces and how the column studs are to be placed when framing.

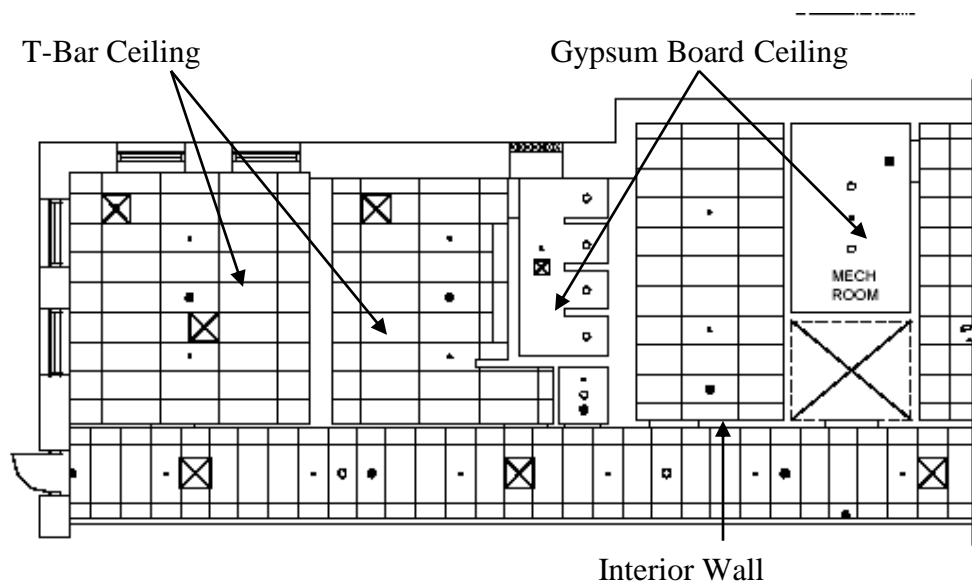


In the fire rated detail below, two layers of 5/8" type "x" gypsum board is to be installed between the two metal studs, which are spaced 3 1/8" apart from the center of the flanges. The airspace between the two layers and the web of the stud allows for movement. No more than 1/2" space is allowed for the metal control joint in each layer of 5/8" type "x" gypsum board.



## Reflected Ceiling Plan

For the drywall/lather, the reflected ceiling plan is the second most important plan for information and work to be performed. Suspended drywall ceilings, t-bar ceilings, soffits, skylights and draft stops will be shown on this plan, along with their installation height above the floor. Recessed or surface mounted lighting is usually shown and is important to verify how this may affect the framing. Dimensions for layout will be shown on this plan for suspended construction, such as t-bar ceilings. The reflected ceiling plan will be overlaid on the floor plan, with the walls shown, but the walls will not be noted as on the floor plan. Section and details callouts will also be noted on the reflected ceiling plan.



## Door and Window Schedules

Information about doors and windows are provided in the form of a chart, listing the sizes (width, then height), type of frame, type of door, hardware, fire rating and any remarks or special framing details. Each door or window listed in a schedule is referenced to the plan in the form of a number or letter. The number or letter used in the schedule is placed next to the door or window on the plan or elevation. Usually the room number will correspond with the door number.

Schedules are used when framing to determine the correct rough openings and for proper placement of doors and hardware during installation. There are other types of schedules with useful information such as finish and lighting schedules. A finish schedule specifies interior finish material for each room in the building, providing information for the walls, floors and ceilings.

<b>Building Door Schedule</b>											
Door No.	Door					Frame			Fire Rating	Hd ware	Remarks
	Type	Size	Thick	Material	Finish	Type	Material	Finish			
100	A	3'-0"x7'-0"	1 3/4"	Wd	Pref	A	3pcHM	Paint	C	B	
101	A	3'-0"x7'-0"	1 3/4"	Wd	Pref	A	3pcHM	Paint	C	B	Louwer
102	A	3'-0"x7'-0"	1 3/4"	Wd	Pref	A	3pcHM	Paint	C	B	
103	B	3'-0"x7'-0"	1 3/4"	Wd	Pref	A	3pcHM	Paint	C	B	Louwer
104	C	6'-0"x7'-0"	1 3/4"	Wd	Pref	A	3pcHM	Paint	C	B	
105	A	3'-0"x7'-0"	1 3/4"	Wd	Paint	B	Alum	Prefin	C	B	

HM-Hollow Metal, Alum- Aluminum, Pref Prefinished, Wd- Wood

<b>ROOM FINISH SCHEDULE</b>										
Room No.	Room Name	Flr.	Base	Walls				Cl'g	Cl'g Ht.	Remarks
				N	E	S	W			
100	Reception	Qt	Vc	Pt	Pt	Wc	Pt	Gb	10'-0"	Wall Reveals
101	Office	Cpt	V	Pt	Pt	Pt	Pt	Act	9'-0"	
102	Office	Cpt	V	Pt	Pt	Pt	Pt	Act	9'-0"	
103	Office	Cpt	V	Pt	Pt	Pt	Pt	Act	9'-0"	
104	Class Room	Vct	V	Pt	Pt	Pt	Pt	Act	9'-0"	
105	Conference	Cpt	V	Pt	Pt	Pt	Pt	Act	9'-0"	

Qt- Quarry Tile  
 Ct- Ceramic Tile  
 Cpt- Carpet  
 Vct- Vinyl Composite Tile  
 Gl- Glass  
 V- 4" Vinyl Base  
 Pt- Paint  
 Open- Exposed Construction  
 Act- 2x2 Acoustical Ceiling Tile  
 Vt- Vinyl Tile  
 Bl- Concrete Block  
 Cs- Sealed Concrete  
 Dw- Drywall  
 Vc- Vinyl Cove Base

## Structural Plans

Structural plans will include the steel columns, beams, girders along with the concrete footings and foundation walls. Structural plans will include section views, elevation views and detail drawings relating to the overall support structure of the building. Load bearing metal stud or structural walls, ceilings, roof structures are found within these drawing and are highly detailed as to the materials and connections used. Roof screen framing can be located in the structural plans due to the wind loads, which require engineering.

## Electrical Plans

The electrical drawings contained in a set of blueprints will show switches, convenience outlets, dedicated outlets, distribution panels and lights along with their layout. Electrical drawings will be similar to the architectural drawings because they will show walls and ceilings but will reference electrical construction. Electrical drawings are useful to refer to if you need to confirm any lighting, switches, outlets, etc.

## Mechanical Plans

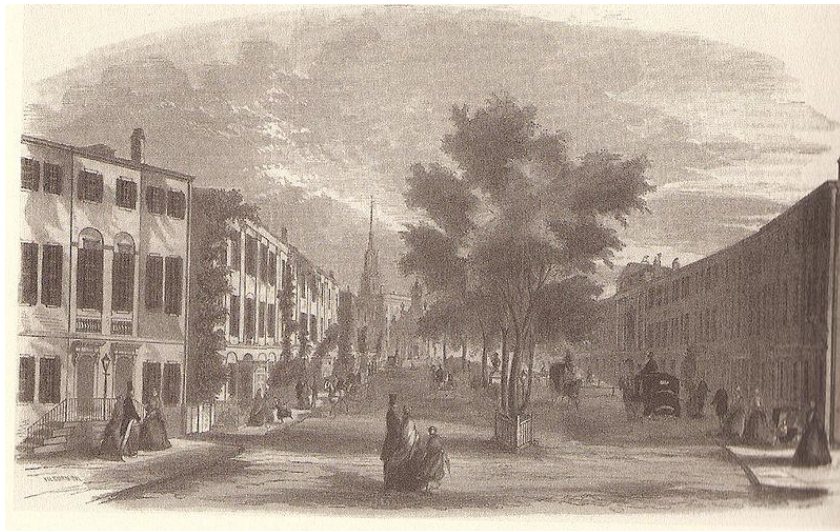
Sometimes called HVAC plans (heating, ventilation and air-conditioning), these plans will show ducting, supply and return air registers, fire dampers and thermostat locations. Mechanical drawings are useful to refer to when coordinating the job, especially if you have a lot of full height partitions, fire dampers, soffits, or draft stops. Drywall duct shaft enclosures may be shown on these plans also.

## Plumbing Plans

The plumbing plan will show the layout of the piping system for the hot and cold-water lines, waste systems, and the fixture locations. Isometric drawings are used to diagram the connections to water closets, sinks hose bibbs, etc. Usually a thicker wall with at least six-inch studs is required for walls with plumbing and this is shown on the architectural floor plan.

## Views

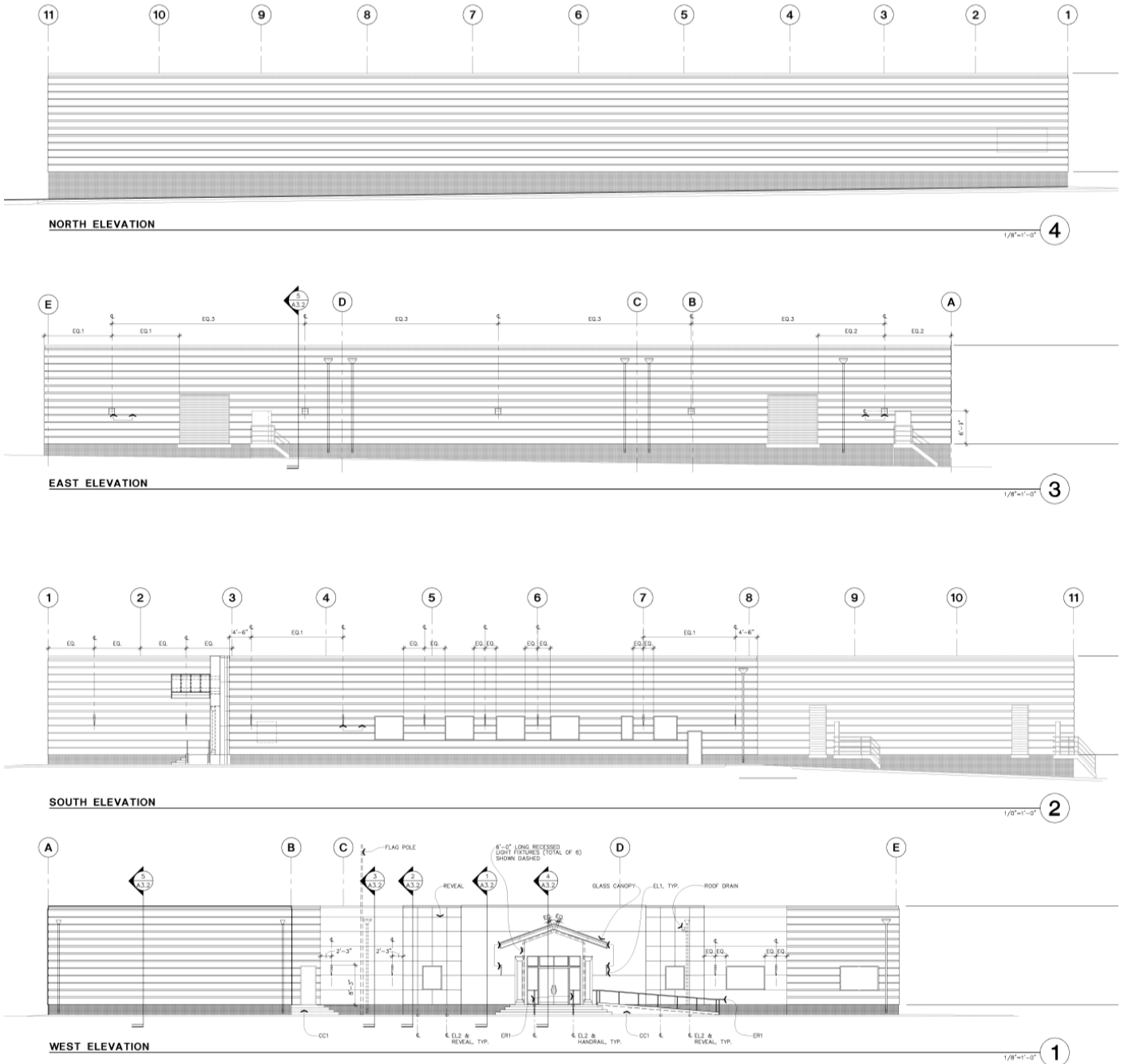
One of the most important aspects of reading blueprints is to understand how the types of drawings relate to each other. Each drawing is a particular view of the project. One of the easier drawings to visualize and therefore understand is the pictorial drawing. A pictorial drawing is a rendering of the building with trees; shrubs and shading that makes it look more realistic. However, they are not practical drawings from which to build a building.



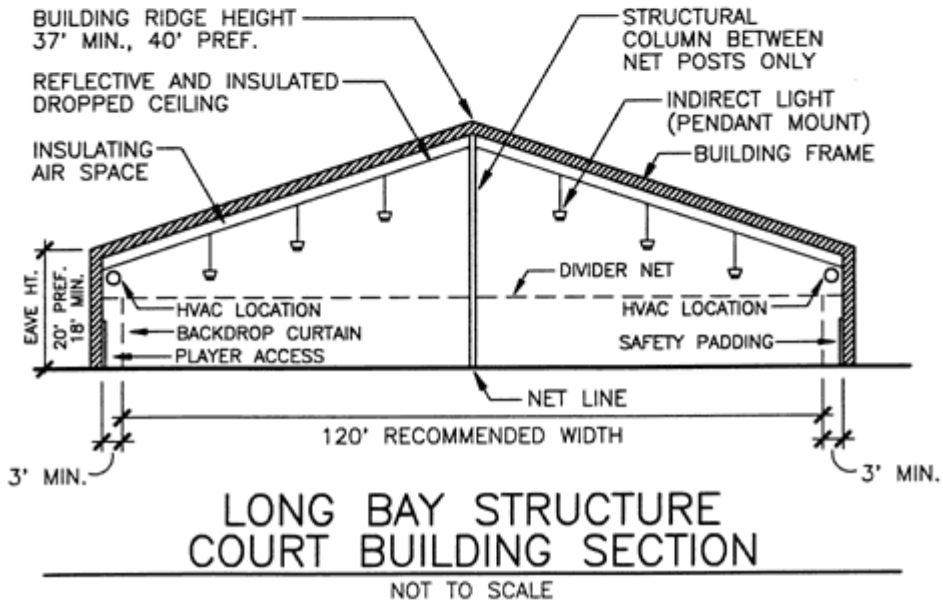
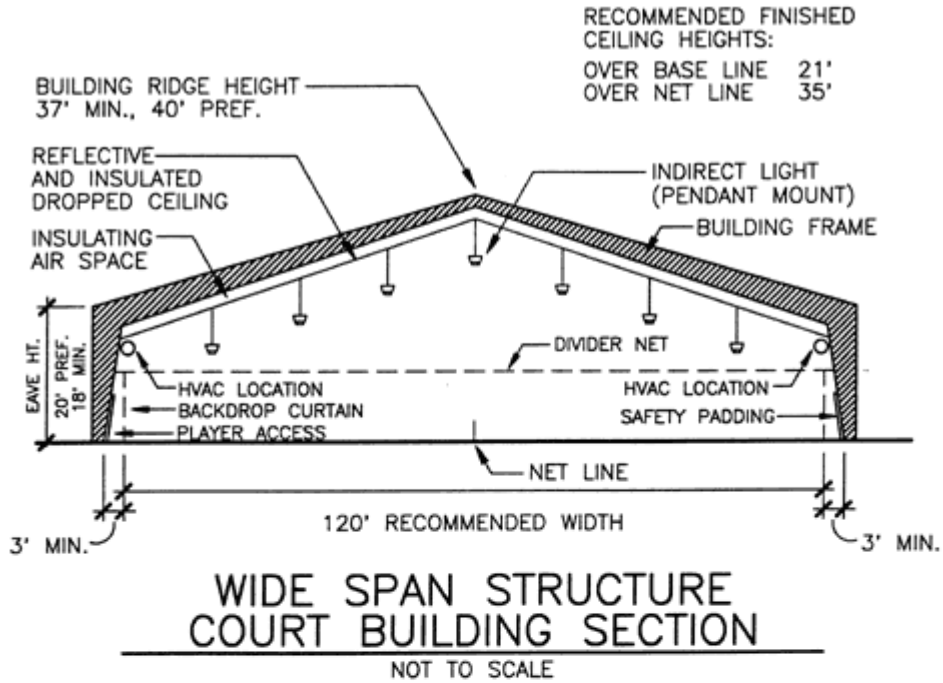
Architects will show many views of the building in a set of blueprints. These views are called orthographic projection. Each view is taken from a different reference point, but each view is perpendicular to one another. Imagine a square box and rotate it looking at all sides, each side represents a different view. This is the same process when looking at a building in a set of prints. The top view as you are looking down is called a plan view. A plot plan, floor plan, reflected ceiling plan are all examples of plan views. The front, sides, and back as you are looking at the box are called elevations. If we were to cut thru the box and look inside this would be called a section.

Nearly all construction drawings are created using orthographic projection. This allows for more detailed information to be shown, but the appearance of the building is not as obvious as it would be in a pictorial drawing, because only one side or face is drawn. With practice, you will be able to visualize the completed structure by combining the various views and find the information needed to build a project using orthographic drawings.

### Examples of Orthographic Projection



Building Sections: Longitudinal Views



Symbol used for transverse and longitudinal section views



## Care for Blueprints

When you start running work for your employer, he or she has placed a lot of responsibility in your hands. Prints and the related specification book are as important as the tools you make your living with every day, so they must be handled properly. Here are some guidelines:

- Do not eat or drink near prints.
- Roll prints carefully.
- Keep prints out of direct sunlight, otherwise they will fade and discolor.
- Store prints in a clean, dry place.
- During layout, be careful of chalk spilling onto the prints.
- Keep prints clean. Clean prints will not contribute to errors or be difficult to read.
- Misplacing or losing the prints goes without saying.

## Guidelines to Print Reading

There is not one absolute certain way to read prints. What works for one person may seem confusing to another. Below are some basic principals when reviewing a new set of blueprints and you may find other ways to suit your needs. One of the most important guidelines is to **read** all of the sheet notes and leader notes found on the plans, details, sections and elevations. Once you become familiar with a set of prints, finding information is fairly simple.

- **Check all plans against the sheet index.** Check the title blocks for sheet numbers and the titles of each sheet, and make sure all of the plans are contained in the set, especially the architectural drawings. It is rare not to have all the drawings, but mistakes can be made.
- **Review the Index Sheet.** Start with the Index sheet and review the symbol legend, each architect will draw his symbols a little differently, so you will need to review the architects' use of symbols. If the Index sheet has the General Notes section, **read** each and every note. If there is information about the dimensions, determine if they are finish or otherwise. There will be important information contained in the notes, which should **not** be overlooked. If there is a location map for the work in an existing building, confirm where the project is to be built. For example, the work is to be performed on the second floor-east wing or the seventh floor of a high rise.
- **Briefly review each Architectural sheet.** Review each sheet in the order they are placed in the prints, to get a "feel" for the drawings. At this point, you are not looking for anything in particular, but briefly reviewing each sheet to become familiar with the drawings and the project. Start with the floor plan and end with the detail sheet or the last architectural drawing.

- **Review the floor plan in detail.** You should have a basic understanding of the job and the drawings. Go back to the floor plan and review this plan in detail. Review the wall legend and become familiar with the wall types. Where are the full height and fire rated walls? Are there any enlarged drawings for the bathroom core or lobby areas? The elevation and detail callouts should be researched at this point. Do the full height walls have any special conditions such as slotted or slip tracks? What on center framing are the walls? Any insulation? Fire caulking? What about the door and window sizes, frame types? Are there any hidden lines shown? These are all questions requiring answers at some point during construction and the answers will be found in the details, on the elevations, sections and schedules. If any items are detailed as “typical”, this means all of the same conditions will be built according to the typical detail, but will not be detailed over and over in an effort to save space on the drawing.
- **Review the enlarged area drawings.** Enlarged area drawings, which are drawn to a larger scale than the floor plan, will give more information than could be placed on the smaller scaled drawing. Examples of enlarged area drawings could include: bathroom core areas, lobby areas, stairwells, skylights, etc. Use of the enlarged area drawings should always be thought of when they are given. Enlarged area drawings are not usually found on the detail page, although they are enlarged drawings. This may seem confusing, but enlarged area drawings are not construction details.
- **Color-code the walls.** Now is good time to color-code the walls, (if this is your preference), matching the walls on the floor plan with the wall legend. You may want to mark all of the one-hour full height walls yellow; under the grid walls could be green and so forth. Color-coding makes it easier for quick referencing, but use a marker that will not obscure any information.
- **Review the elevations.** You have probably reviewed the elevation sheet from the referenced callouts on the floor plan, but make sure there are not any overlooked views. Many times there will be cutting plane or section symbols placed on elevations and these should be reviewed at this point. Are their any special materials being used? For example, ceramic wall tile in the bathrooms or reveal metal in a gypsum board wall. The ceramic tile may require cement backer board instead of green board, which may be referenced in a section view. As we’ve said before, heights for ceilings, soffits, backing for wall mounted items and recessed enclosures will be found on these drawings because of the vertical view.
- **Examine the schedules.** The door and window schedules should be reviewed for door size and type of door frame. Many times the same size door and type of frame are used through out a job, which makes it easier to build. If any special sized doors or frames are used, locate the symbol or number from the schedule and make a mental note of its location on the floor plan.

Door and window framing details (inverted track or studs, double king studs, box headers, etc.) can be referenced from the door schedule by a detail callout. Elevation views of the doors and frames are sometimes referenced and shown somewhere near the schedules, which will help in the visualization of the doorframe configuration. The finish schedule will have information on floor and wall finishes; make a note of any finishes, which could affect the finished heights of soffits and ceilings. Items such as marble tile and hardwood flooring will change the height of ceilings and soffits after the flooring is installed.

- **Review the reflected ceiling plan.** Many of the hidden lines found on the floor plan will become apparent on the reflected ceiling plan. If there is a ceiling legend shown, it will specify the items found on this sheet. Items to look for are: soffits, gypsum board ceilings, draft stops, skylight shafts and any recessed fixtures placed within a ceiling. If the job is a commercial project, the majority of the ceiling area will probably be t-bar, drawn as a grid pattern. If the t-bar is continuous and drawn over the top of a wall, then this partition is an under the grid wall. If the grid stops at the wall and starts on the other side, then this partition penetrates the grid system. The finished heights of items above finished floor are shown and are placed within an elliptical circle or box within the ceiling area.
- **Review the sections and detail sheets.** You will have already reviewed these sheets from cross-referencing the floor plan or other drawings. There may be some details or section views not called out on the floor plan. Find any details or sections not previously studied and locate the callouts to which they are referenced within the drawings. Each detail is telling you how to build something, but you will need to interpret the information. Construction details are enlarged to show what materials are used and the methods of attachment.
- **Determine the partition layout.** Where are the layout dimensions originating on the floor plan? Centerline of a column, an existing wall, exterior wall or aluminum storefront? If there are any missing dimensions, you may find this information on an elevation or an enlarged area plan. If the missing dimension is not shown, then request this information from the general contractor or architect.

## Layout of the Project

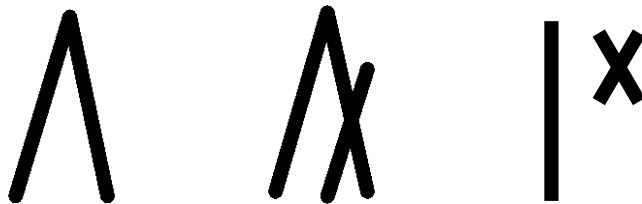
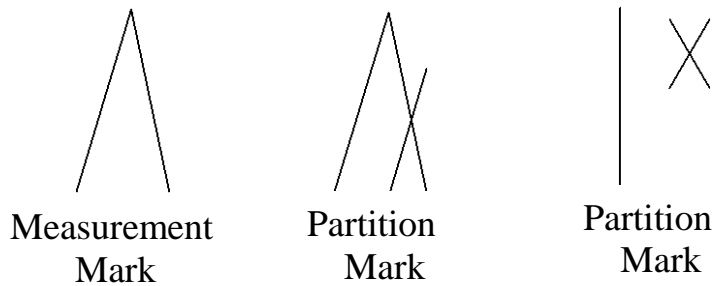
Layout of a project may seem a bit overwhelming when you see it done for the first time. There will be a lot of information required to properly layout the building and this information will be provided from the blueprints. Your job is to locate the information needed. In this section we will establish some basic procedures for laying out a project.

## How to Make Marks

This may seem very basic but marking the layout lines is an important aspect. Certain procedures and marks should be used to avoid confusion. If you prefer to mark each side of the wall or just one side and flag your mark, that is fine, as long as it is consistent. When you flag your mark, putting an x on part of the arrow, identifies the side of the mark the track is to be placed. Use a carpenter pencil or Sharpie to make your marks. Use a point on your marker that will clearly define the mark or measurement and a dull pointed marker should not be used such as a kiln (crayon) marker or a dull pencil. This principle is consistent for all marks you make, including swinging arches for square. Some examples of correct and incorrect marks are shown on the following page:

### Marks used when placing a measurement

Correct with well-defined points.



Incorrect, points are **not** well defined.

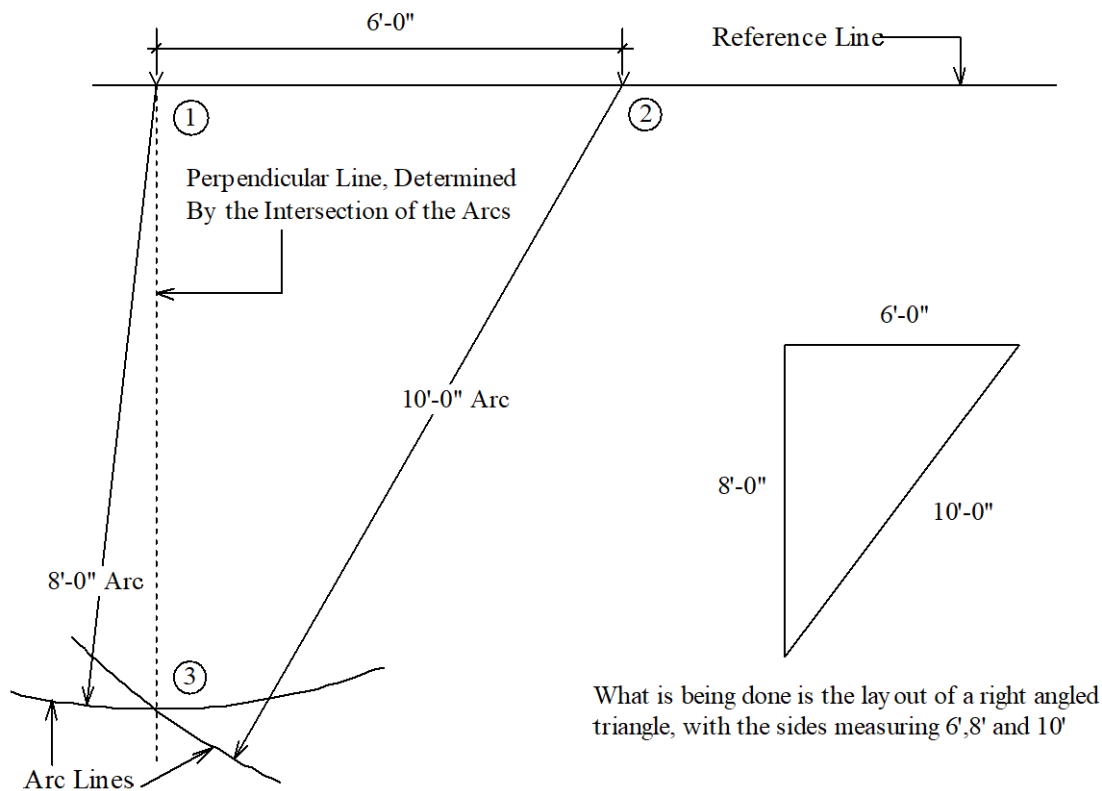
## How to Establish a 90° Angle

Many times, the general contractor will have established control lines, usually placed along the building column lines. These lines are placed in two directions, intersecting at a 90° angle, which establishes building square. These are to be used as reference lines, keeping your partition layout parallel and square to the control lines. One of the first steps you should perform is to check the control lines as being square, never assume the fact that they are square, mistakes are made every day.

If control lines are not provided, you will need to establish square. Locate the column line most useful for layout purposes, usually the column line where the dimensions are starting. Go to the columns farthest apart and find the center of these columns. From this mark, measure over any amount, usually in increments of 12 inches and make another mark and snap a line parallel to the columns. There are other factors involved in establishing this line, but for now we will need to provide the 90° angle.

Many of you are familiar with the process of using 3,4,5 when squaring a line. Other multiples of **3,4,5** should be used when the layout lines extend a greater distance.

To find other multiples of 3,4,5, simply multiply these numbers by any number you choose. For example, if you multiply each number 3,4,5 by the number 8, you would get:  $(3 \times 8) = 24$ ,  $(4 \times 8) = 32$ ,  $(5 \times 8) = 40$ . These numbers **24,32,40** can now be used to establish square. An example of using the ship builder's method (3,4,5) is shown below, using the multiple of 2, therefore **6,8,10**:



In the example shown above, the following steps should be followed to create the perpendicular line:

- 1). Establish a wall line, with a given dimension from the prints.
- 2). Determine the multiple of **3,4,5**, in this case **6,8,10** is used.
- 3). Properly mark the dimension where you want the perpendicular line to start (Point #1) on the established wall line, which is usually a given dimension from the prints or a point to establish a control line.
- 4). From the dimension mark (Point #1), measure down the established wall line a distance of 6'-0" (Point #2) and properly mark this location.
- 5). Swing the 10'-0" arc, from the 6'-0" mark (Point #2).
- 6). Swing the 8'-0" arc, from the mark (Point #1) previously established.
- 7). At the intersection of the two arcs (Point #3), snap a line connecting (Points 1 & 3).
- 8). You have now established a perpendicular line.

## Layout Procedures

As previously mentioned, you will need to have an understanding of the dimensions given on a set of blueprints. A dimension given to face of framing is completely different from finish or centerline dimensions. On the next few pages is a simple layout project. The basic steps to laying out this project are given step by step.

Laying out a project is simply a matter of snapping parallel lines from the reference lines to given dimensions as shown on the drawing. Once the reference and perpendicular lines have been established in the proper locations, use these lines to measure from for the other layout lines. There is not a need to use the 3,4,5 method for any other layout lines, once the 90° angle has been established. On the following page is the drawing to be laid out. Reading the notes at the bottom of the drawing tells us that the dimensions are to face of framing. Now we can proceed with the layout.

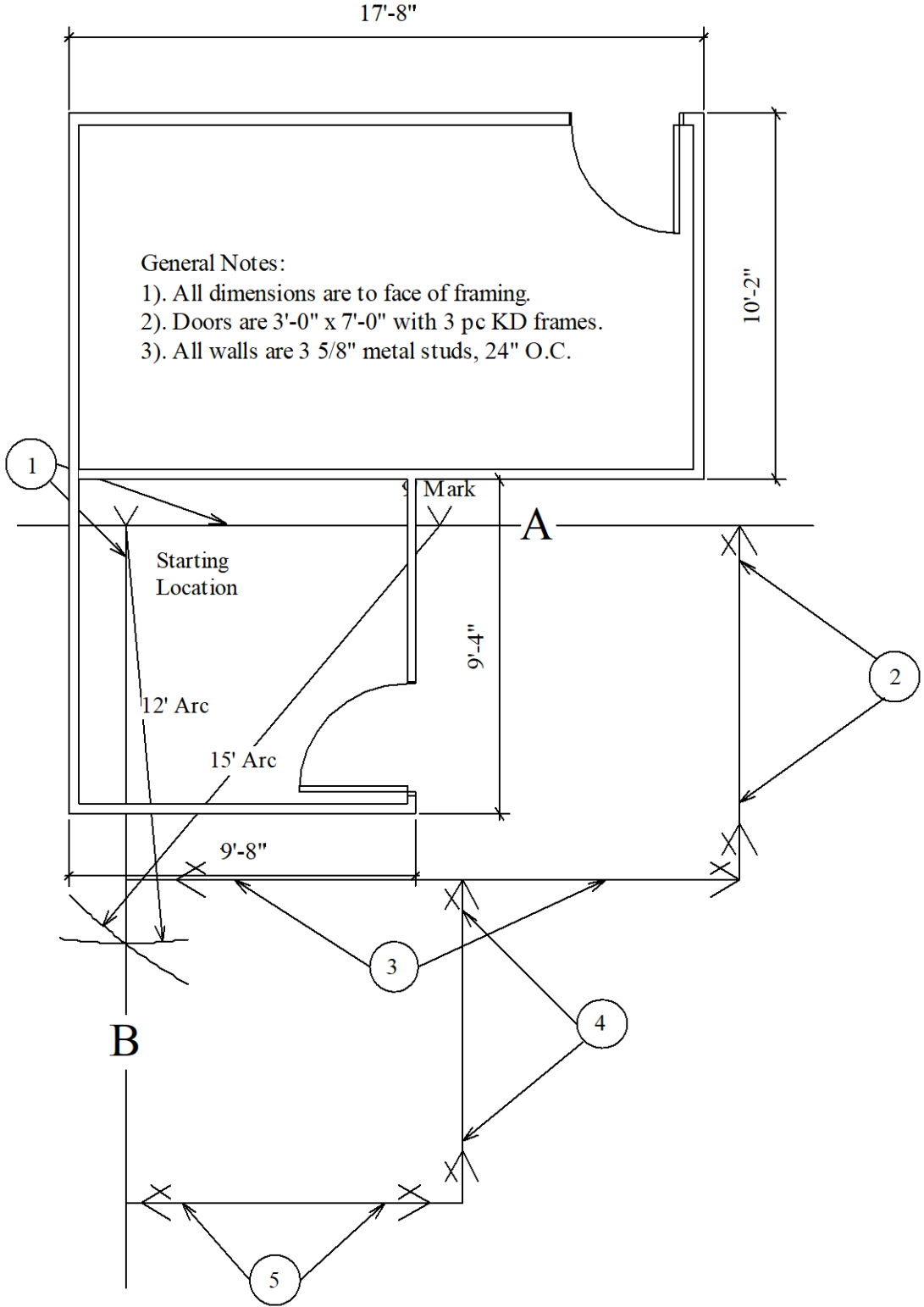
## Steps to Layout:

- 1). Establish the reference line A and swing the arcs to determine the perpendicular line B. Reference lines A & B are the outside frame lines for two walls of this project. In this case, the 3,4,5 has been multiplied by the number 3, giving us 9,12,15. Snap the perpendicular line B through the intersection of the arcs and the reference mark. We have created two lines A&B as shown by Note 1.
- 2). Establish the wall shown by Note 2. Measure over 17'-8" in two locations from line B and place your marks, flagging to the inside. One way to avoid mistakes is make sure you are on the outside of the wall line for all marks to be made. This also follows the extension lines as shown on the drawing; they originate from the outside of the walls also. Snap the wall line.
- 3). Establish the wall shown by Note 3. Measure over 10'-2" in two locations from line A and place your marks, flagging to the inside of your mark. Snap the wall line.
- 4). Establish the wall shown by Note 4. Measure over 9'-8" in two locations from line B and place your marks, again flagging to the inside. Snap the wall line.
- 5). Establish the wall shown by Note 5. Measure over 9'-4" in two locations from the wall shown as Note 3, again flagging to the inside. Snap the wall line.

At this point the project has been laid out, except for the inside wall lines and door openings. If you noticed the steps taken to laying out this project was to snap parallel lines to those established by the referenced lines.

Some drywall companies will only snap one wall line and flag the marks as shown above. Other companies will snap both sides of the wall, so follow the established procedure in your company. Determine the required rough openings for the doors, based on the frame type and size of door. In this case the rough opening will be 38 inches. If both sides of the wall lines have been snapped, then measure over 4 inches from the inside of your wall, allowing for a door leg, then the 38 inches required for the rough opening. If the outside wall line is the only line laid out, then measure over 7 5/8 inches, then the 38 inches for the rough opening. 7 5/8 inches is the 4 inch door leg and 3 5/8 inches for the width of the track, totaling 7 5/8 inches.

# Layout Procedures





**NOTES:**

## Chapter 1 Study Guide

**Directions:** Answer the following questions using the **bubble answer sheet**.

- 1). Blueprints are organized into sections as to the sequence of construction.
  - A) True
  - B) False
  
- 2). Another term used for a set of blueprints is sometimes called \_\_\_\_\_.
  - A) Interpretation drawings
  - B) Sepia's
  - C) Working drawings
  - D) Tracing
  
- 3). Within the structural drawings, you would find the dimensions to layout all partitions, doors and windows.
  - A) True
  - B) False
  
- 4). Which section of the blueprints is not a common section used.
  - A) Architectural
  - B) Electrical
  - C) Structural
  - D) Civil
  
- 5). Within the major sections of a set of blueprints, it is common to find other drawings or prints.
  - A) True
  - B) False
  
- 6). A section or "cut" drawing of a wall would show the major components used in the construction.
  - A) True
  - B) False
  
- 7). Sectional views through the narrow width of the building would be the \_\_\_\_\_ view.
  - A) Longitudinal
  - B) Transverse

- 8). Sectional views through the long dimension of the building would be called \_\_\_\_\_ view.
- A) Longitudinal
  - B) Transverse
- 9). The **most** important plan for the drywall/lather would be the:
- A) Plumbing plan
  - B) Floor plan
  - C) Reflected Ceiling plan
  - D) Detail page
- 10). Details are usually drawn to the same scale as floor plans.
- A) True
  - B) False
- 11). What plan would show the installation heights of soffits, gypsum board ceilings, and t-bar ceilings?
- A) Floor plan
  - B) Reflected Ceiling plan
  - C) Foundation plan
  - D) Civil plan
- 12). A \_\_\_\_\_ drawing is a rendering of the building with trees; shrubs and shading that makes a picture look more realistic.
- A) Orthographic
  - B) Pictorial
  - C) Topographic
  - D) Section
- 13). A view in which you are looking down is called a plan view.
- A) True
  - B) False
- 14). In an orthographic drawing, only one view is drawn at a time.
- A) True
  - B) False
- 15). An elevation view of a building, would be a vertical view or a view as if you were standing looking directly at the building.
- A) True
  - B) False

**Chapter 1**  
**Blueprint Reading Exercise #1**

**Directions:** Match the following items found in a set of blueprints to the choices given below. You may use each choice more than once.

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| <b>A.</b> Index Sheet            | <b>G.</b> Door or Window Schedule |
| <b>B.</b> Floor Plan             | <b>H.</b> Structural Plan         |
| <b>C.</b> Elevation Sheet        | <b>I.</b> Electrical Plan         |
| <b>D.</b> Section Sheet          | <b>J.</b> Mechanical Plan         |
| <b>E.</b> Detail Sheet           | <b>K.</b> Plumbing Plan           |
| <b>F.</b> Reflected Ceiling Plan | <b>L.</b> Finish Schedule         |

- |  |                                  |
|--|----------------------------------|
| 1. _____ North View Drawing            | 21. _____ Material for Flooring  |
| 2. _____ Location of Columns           | 22. _____ Load Bearing Wall      |
| 3. _____ Project Location Map          | 23. _____ Index List of Drawings |
| 4. _____ Longitudinal View             | 24. _____ Switches & Outlets     |
| 5. _____ Special/Unusual Construction  | 25. _____ Water Closet (Toilet)  |
| 6. _____ Location of a Drywall Ceiling | 26. _____ Thermostat Location    |
| 7. _____ General Notes Section         | 27. _____ Beams & Girders        |
| 8. _____ Transverse View               | 28. _____ Soffits                |
| 9. _____ Light Layout                  | 29. _____ Type of Door           |
| 10. _____ Door Location                | 30. _____ Partition Legend       |
| 11. _____ Hot & Cold-Water Piping      | 31. _____ Stairway               |
| 12. _____ Fire Dampers                 | 32. _____ South View Drawing     |
| 13. _____ Skylight                     | 33. _____ Door Rough Opening     |
| 14. _____ Door Size                    | 34. _____ T-Bar Layout           |
| 15. _____ List of Abbreviations        | 35. _____ Carpet                 |
| 16. _____ Dimensions for Walls         | 36. _____ Foundation Wall        |
| 17. _____ Left Side View               | 37. _____ Power Plan             |
| 18. _____ Type of Window Frame         | 38. _____ Built-in Cabinets      |
| 19. _____ Draftstops                   | 39. _____ “Cut” View             |
| 20. _____ Toilet Fixtures              | 40. _____ Methods of Attachment  |



## Chapter 2 Lines and Symbols

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### Objectives:

At the end of this chapter, students will be able to:

- 1). Understand the meaning of different lines used in construction drawings.
- 2). Recognize the significance of symbols and their use in construction drawings.

### The Alphabet of Lines

For architects to convey ideas to the craftsman, they will use a variety of lines. Some will vary in width, some will be solid, some are broken, some will have long or short dashed lines and some a combination of both. Each conveys a different meaning. Some common lines used are:



#### Border Line

- *Border Line:* Border lines are located near the edge of the sheet of drawing paper. They are also used to separate the various portions of the drawing, such as the title block, notes, and the revision block.



#### Object Line

- *Object Line:* Object lines represent the main outline features of the object, building, ceiling or wall. The object line is a heavy, continuous line, showing all edges and surfaces.



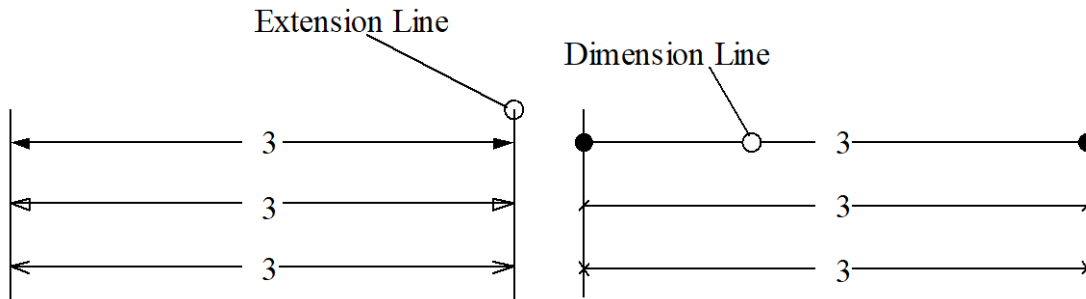
#### Hidden Line

- *Hidden Line:* Hidden lines are medium weight and composed of short dashes. They define edges and surfaces not visible in a particular view. The drywall/lather must look for another view in the set of drawings to find where these edges occur. Often, these hidden parts will be revealed in an elevation or sectional view.

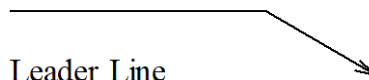


Center Line

- *Center Line:* The center line is used to indicate centers of objects such as columns, lights, windows and equipment. The center line is also used to indicate a finished floor line. This line is lightweight and composed of alternating long and short dashes.

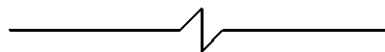


- *Dimension and Extension Lines:* Dimension and extension lines are thin lines that indicate the extent and direction of dimensions. Dimension lines extend for the length of the distance being measured. A marking device such as an arrow, dot or tick is placed at each end of the dimension line. Extension lines are drawn perpendicular to the dimension line to specify the features between which the dimension applies. It is important to make sure which part of the wall or surface the extension line is originating from.



Leader Line

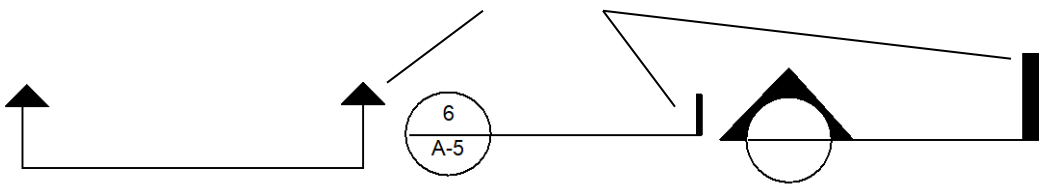
- *Leader Lines:* Leader lines are used when there is not enough room in an area to put a dimension, note or label. Leader lines connect the note or dimension to the object and will have an arrow at the end where they connect to the object.



Break Line

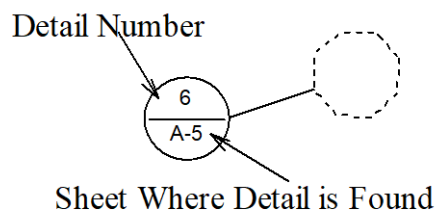
- *Break Lines:* Break lines are used to show only a portion of an object. This saves space on a drawing but be aware a portion of the object has been omitted. For example, a full height wall may be shown at the top track and bottom track and have a break inserted to limit the space used. The break is a line with a “zigzag” inserted in it.

Arrows or tabs show the direction you will be viewing the section.



- *Cutting-Plane Lines:* These lines will indicate an item has been cut revealing what is inside, thus the term “cutting-plane”. As stated previously, these views are called sectional views. The arrows or tabs on the end of the cutting-plane line indicate the direction in which the section is being viewed. Cutting planes are passed through the object at the most advantageous point to provide clear information.

#### Detail Call-out

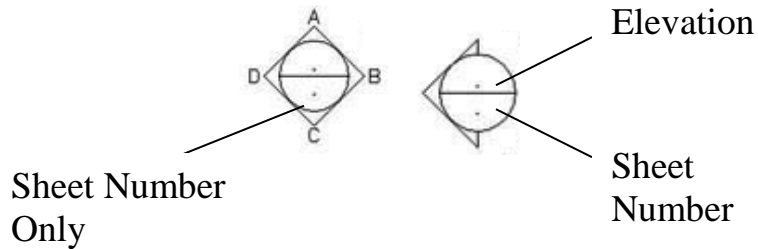


- *Detail Call-out:* These call-outs will indicate where a detail is to be found in the drawings. As in the example above, detail #6 would be found on sheet A-5. Inside the dashed circle will be the item detailed. Enlarged area drawings showing plan views of bathrooms, reception areas, lobbies, etc. will use this detail call-out as well as construction details.

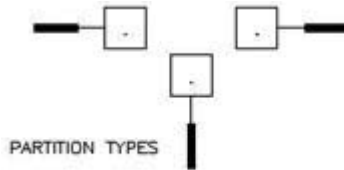


- *Revision Cloud:* These call-outs will indicate a change in the drawings from the original drawings. They are placed around the changed area and the drywall/lather will have to compare the new drawing with the old drawing to become aware of the change. The architect may issue a new drawing sheet or an 8 1/2” x 11” one page drawing. The date of the revision will be included.

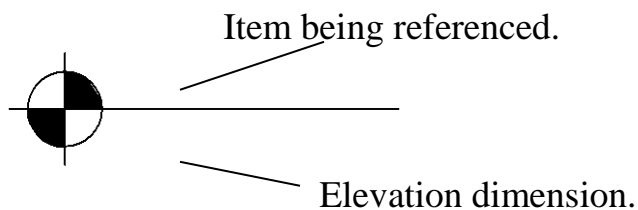




- *Elevation Call-out:* These symbols will direct you to the proper elevation. For the interior elevation symbol on the left above, you would have four elevations A, B, C, and D and referenced to the sheet where they would be located. These callouts are commonly used where multiple elevations of a room is necessary. Keep in mind that each view is projected at right angles to one another.

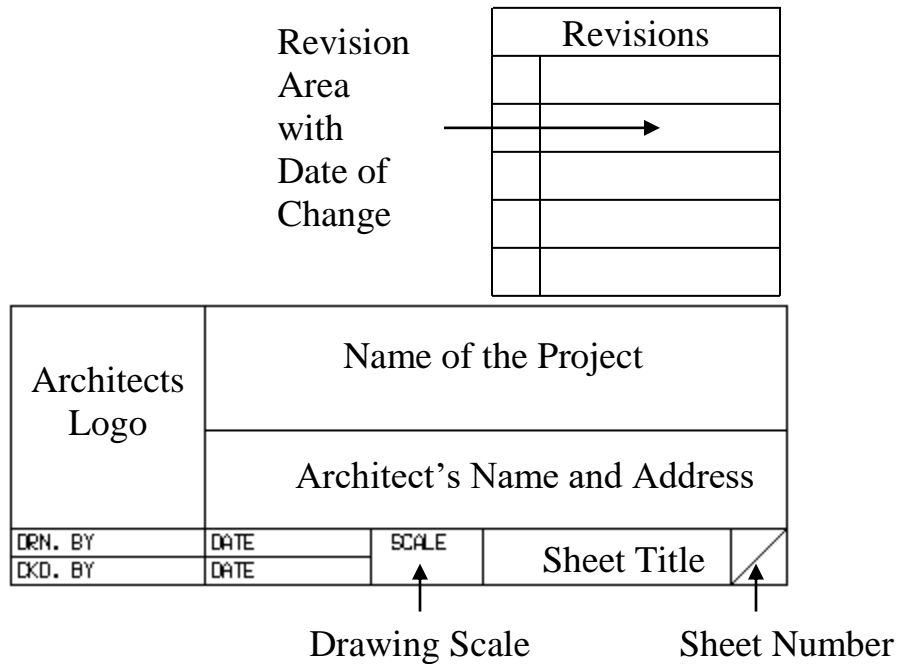


- *Partition Call-out:* These call-outs will identify a particular partition. The tab of the symbol will be placed on the wall, clearly marking the partition type. Not all prints use this type of symbol; some architects will identify the partition by using different patterns within the wall lines. A letter will be placed inside the box for identification and the drywall/lather must confirm the wall type and construction with the wall legend.



- *Datum Symbol:* This is a symbol used to reference a finished height. It will be found on elevation drawings and establishes a given height. The finished heights of a ceiling, the top of an exterior wall or the top of a parapet wall are examples of where a datum symbol may be used. The dimension used with the symbol is measured from the top of the concrete slab or floor. This symbol is commonly found on section views also. The item being dimensioned will be labeled on top of the datum symbol line, with the dimension labeled below the line. On section views there may be multiple datum symbols used, with the floor dimension set as 0'-0" or 100'-0". If the floor elevation is set at 100'-0" it should be thought of as 0'-0".

Architects will use 100'-0" instead of 0'0" to avoid the use of negative dimensions. Say for example an elevator pit is 5'-0" below the floor, it would show an elevation of 95'-0" instead of -5'-0" if the floor is referenced as 100'-0".

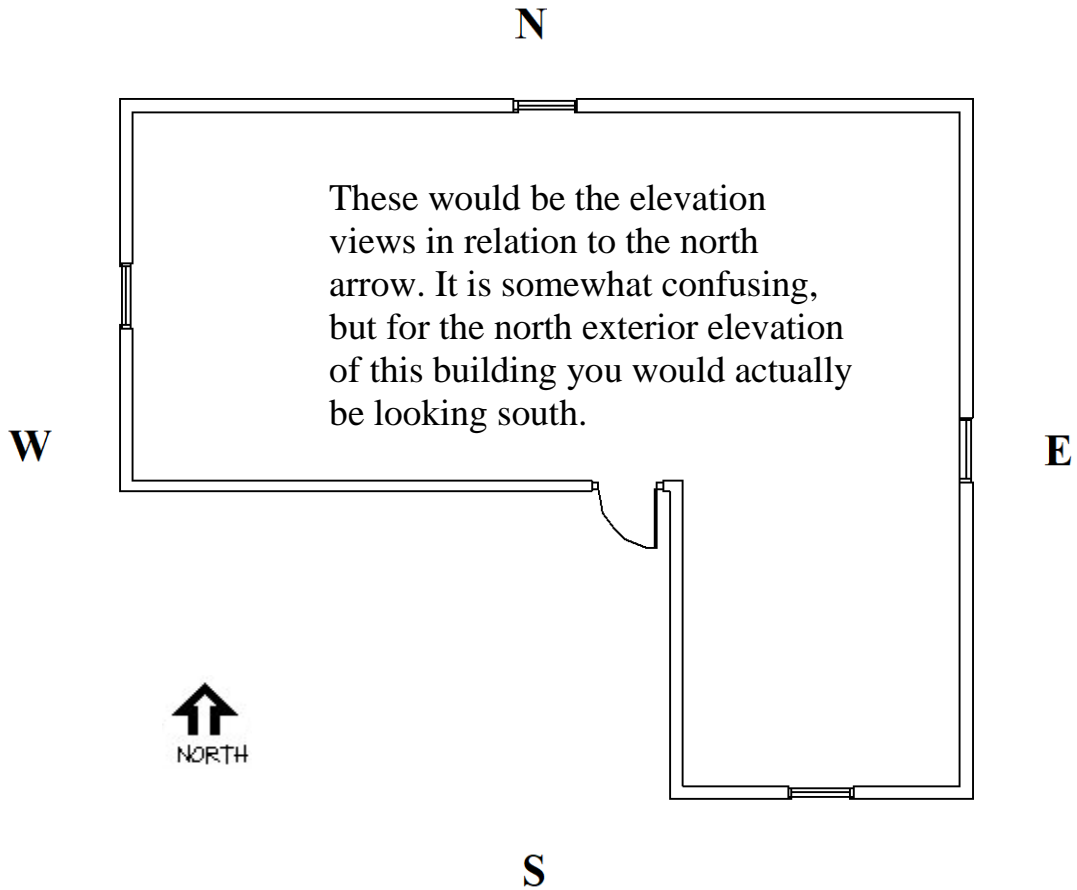


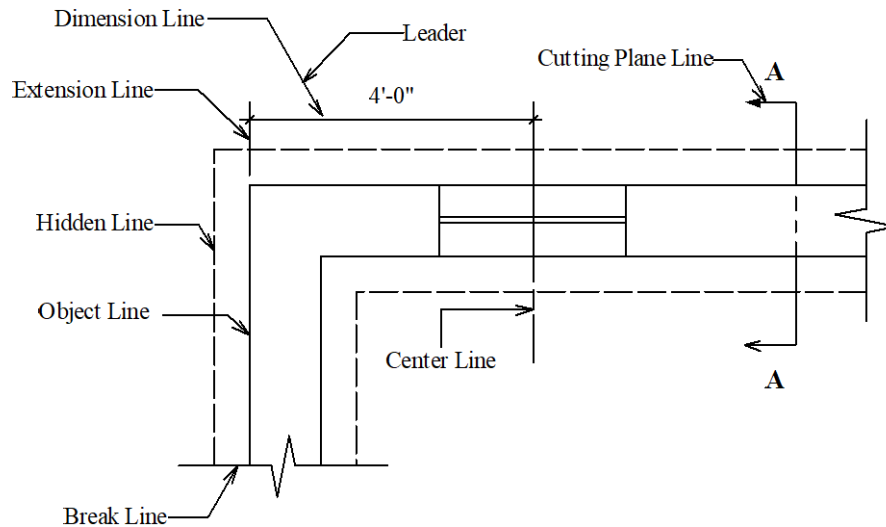
- Title Block:** The title block is located in the bottom right hand corner of each sheet or along the outer right-hand side of each sheet and is the most logical place to start when reading blueprints. The information contained in the title block may vary, but it should contain: the name of the project, the sheet title, the scale of this drawing, the sheet number, the name of the architect and the original drawing date. In the vicinity of the title block, there will be an area for revisions, called a revision block, showing any changes to this particular drawing. The changes will be cross-referenced to the drawing with a Δ symbol and a cloud around the change. The date of the change will also be listed. It is important to have the most current set of drawings available and a check of the revision dates can verify this.



- North Arrow:** The north arrow indicates the north direction and is located on most plan views. If the walls of the structure are not parallel to the compass direction of true north, then a plan North will be designated.

Plan North is a reference direction aligned with the building, which simplifies the description of elevation views. If plan North is established, it is should be noted as such.





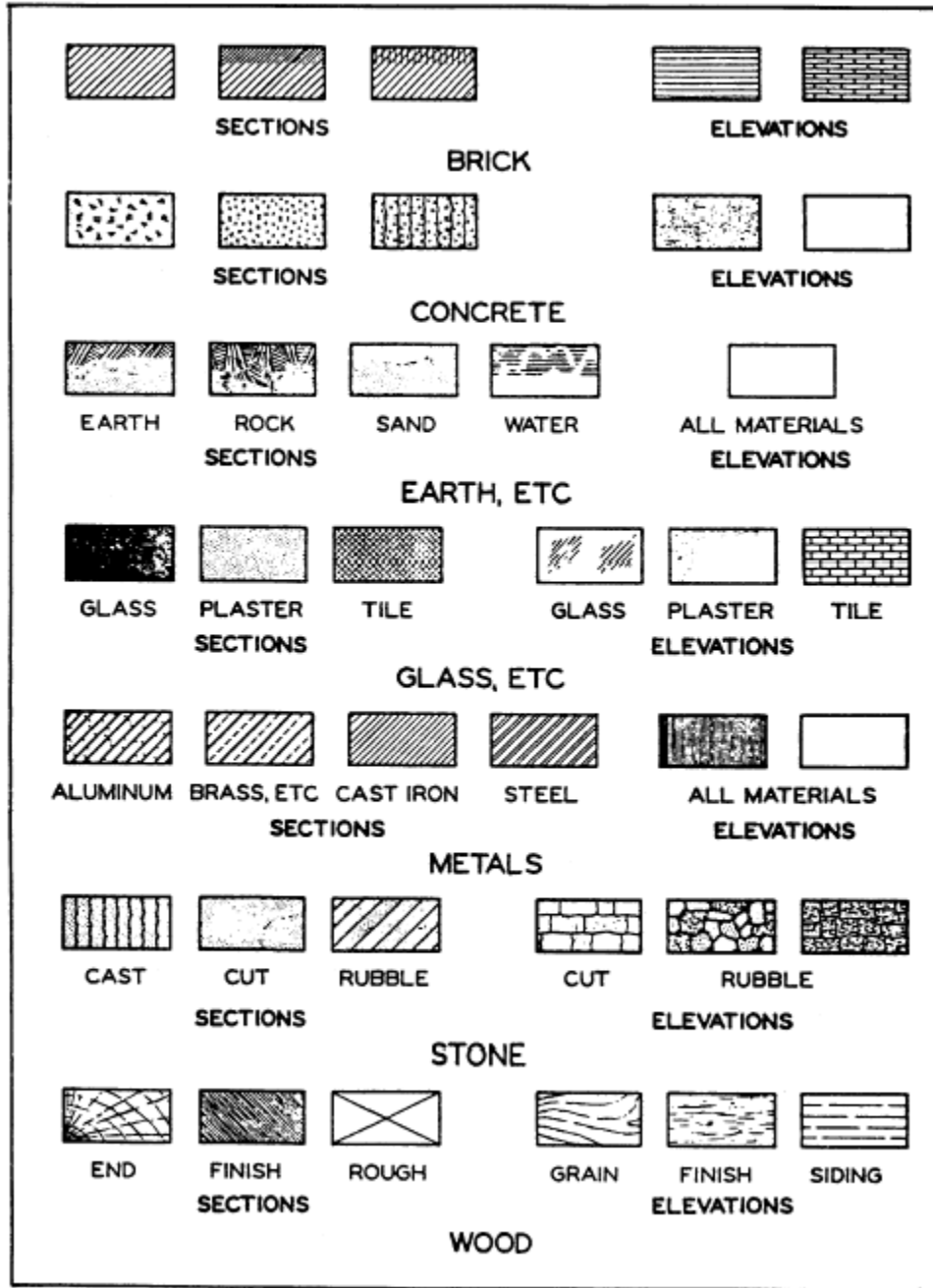
Each line on a drawing has a function.

## Symbols

In order to keep drawings legible, architects will use graphic symbols. Two reasons for this are it saves time, but it also saves space on the drawing. Symbols are used for materials (wood, brick, glass) and for a fixture (electrical, plumbing, appliances, doors, etc.). Symbols are used on detail drawings to clearly show different parts and materials, while other symbols will be used on plan views (floor, framing, etc.), elevation views and sections.

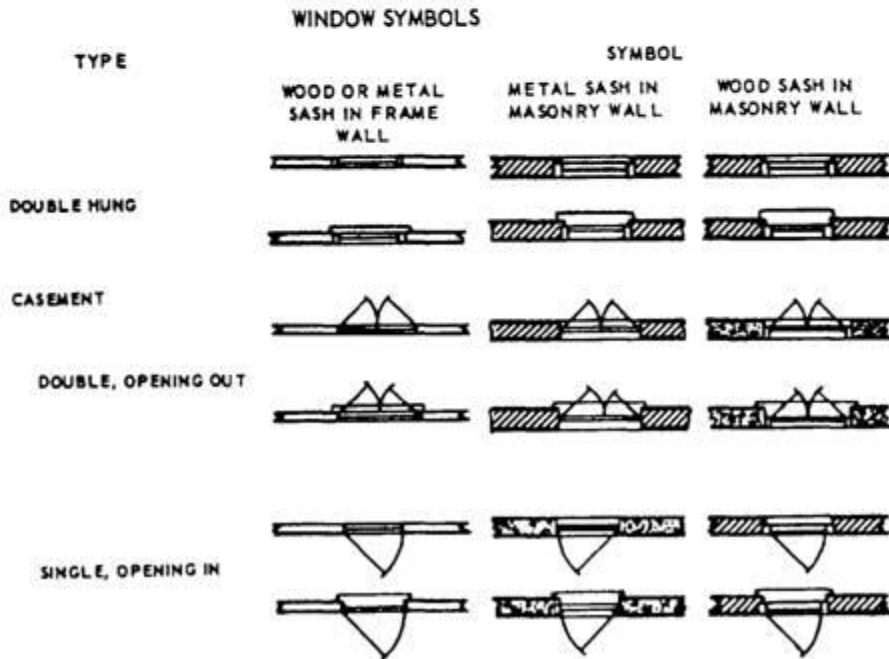
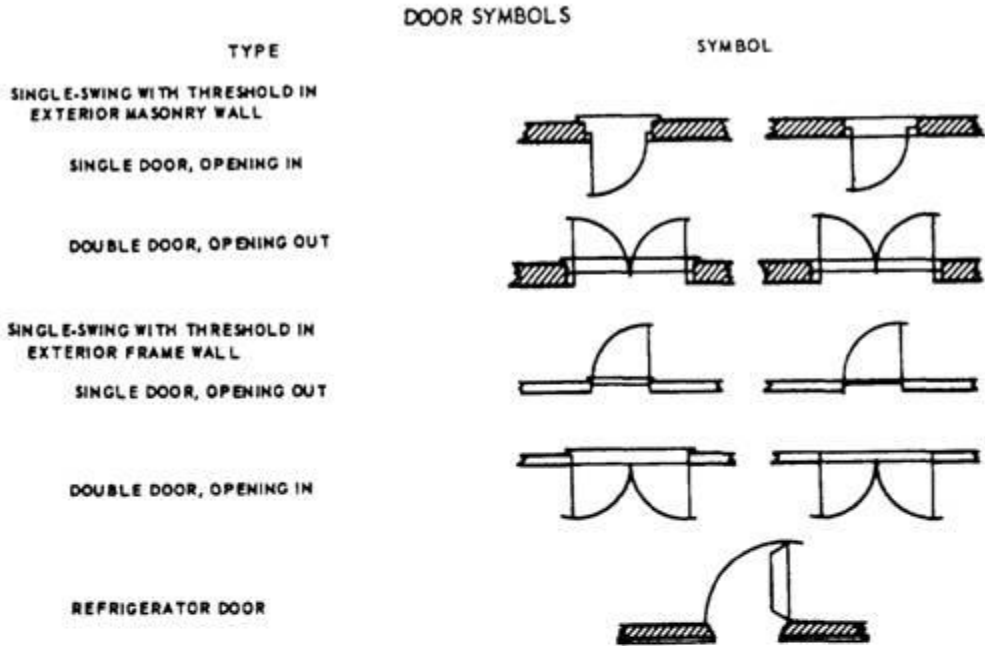
Some fixture symbols have a function or operation shown. For example, closet doors can be bi-folding, sliding or hinged and the symbol will reflect the operation. Sometimes symbols can be found in a legend on the index sheet. Try to become more familiar with the most common symbols for they may affect your area of construction.

Shown on the following pages, are some commonly used material or fixture symbols. Depending on the drawing, the architect may use a section or elevation symbol to express his view, note the two types when given.















Material Symbols  
Section and Elevation Views

The door and window symbols shown below have a function in their operation. Note how the door swings, in or out or the window is fixed or operable.
















The following electrical symbols are a portion of the most commonly used symbols in construction drawings. When symbols, both fixture and material types are used, it is best to cross check the symbol with the legend to understand how the symbol may affect the object being built. Many times, the light fixture will specify the mounting, either recessed or surface mounted, which could affect the framing of a suspended ceiling for example.

### Lighting Symbols

SYMBOL	DESCRIPTION
	CEILING LIGHT FIXTURE, TYPE NOTED
	WALL MOUNTED LIGHT FIXTURE, TYPE NOTED
	1'X4' FLUORESCENT LIGHT FIXTURE, TYPE NOTED
	1'X4' FLUORESCENT LIGHT FIXTURE ON EMERGENCY POWER, FIXTURE TYPE NOTED, EMERGENCY POWER TYPE NOTED
	2'X4' FLUORESCENT LIGHT FIXTURE, TYPE NOTED
	2'X4' FLUORESCENT LIGHT FIXTURE ON EMERGENCY POWER, FIXTURE TYPE NOTED, EMERGENCY POWER TYPE NOTED
	2'X2' FLUORESCENT LIGHT FIXTURE, TYPE NOTED
	2'X2' FLUORESCENT LIGHT FIXTURE ON EMERGENCY POWER, FIXTURE TYPE NOTED, EMERGENCY POWER TYPE NOTED
	POLE MOUNTED, PARKING LOT LIGHT FIXTURE, TYPE NOTED
	CEILING MOUNTED EXIT LIGHT, ARROW POINTING EGRESS
	WALL MOUNTED EXIT LIGHT, ARROW POINTING EGRESS
	DC BATTERY LIGHTING UNIT (NO. HEADS SHOWN)

### Switch and Receptacle Symbols

	SPST WALL SWITCH
	3-WAY WALL SWITCH
	PILOT LIGHT WALL SWITCH
	KEYED WALL SWITCH
	DIMMER SWITCH
	SURFACE RACEWAY AS NOTED ON PLANS
	SIMPLEX RECEPTACLE, 20A, 125V, 2P, 3W, GROUNDED
	DUPLEX RECEPTACLE, 20A, 125V, 2P, 3W, GROUNDED
	SURGE SUPPRESSION DUPLEX RECEPTACLE
	ISOLATED GROUND DUPLEX RECEPTACLE
	DOUBLE DUPLEX RECEPTACLE, 20A, 125V, 2P, 3W, GROUNDED
	RECEPTACLE, 50A, 120/240V, 4P, 3W, GROUNDED
	GROUND FAULT INTERRUPTER RECEPTACLE

## Chapter 2 Study Guide

**Directions:** Answer the following questions using the **bubble answer sheet**.

1). Dimension lines are used to extend the dimension away from the drawing.

- A) True
- B) False

2). Hidden lines define edges and surfaces not visible in a particular view.

- A) True
- B) False

3). Which line represents the main outline of the object being drawn?

- A) Border line
- B) Center line
- C) Break line
- D) Object line

4). Dimension lines will only be terminated with an arrow.

- A) True
- B) False

5). Which symbol would be used to indicate a change in the drawings?

- A) Elevation
- B) Detail
- C) Revision
- D) Section

6). A detail symbol will indicate where a detail is to be found in the drawings.

- A) True
- B) False



7). What type of line would indicate the centers of windows, columns and equipment?

- A) Hidden
- B) Center
- C) Border
- D) Break

8). A leader line is used when there is not enough room in an area to put a dimension, note or label.

- A) True
- B) False

9). What type of line is used to indicate a portion of the drawing has been omitted?

- A) Break
- B) Object
- C) Hidden
- D) Cutting plane

10). A vertical view of an object would be shown by which symbol?

- A) Revision cloud
- B) Partition call-out
- C) Elevation call-out
- D) Title block

11). Some fixture symbols may have a function or operation shown when drawn.

- A) True
- B) False

12). Symbols are used to keep drawings legible and to save space on a drawing.

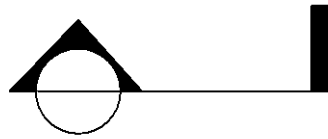
- A) True
- B) False

13). A partition call-out should be cross-referenced with the \_\_\_\_\_ to determine the correct construction.

- A) Wall legend
- B) Index sheet
- C) Title block
- D) Symbol legend

14). A cutting plane symbol would show a sectional view of an object.

- A) True
- B) False

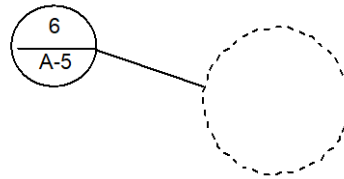


15). What type of symbol is this:

- A) Detail
- B) Cutting plane
- C) Elevation
- D) Revision

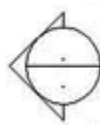
16). What type of symbol is this:

- A) Detail
- B) Cutting plane
- C) Elevation
- D) Revision



17). What type of drawing would this symbol show:

- A) Detail
- B) Cutting plane
- C) Elevation
- D) Revision



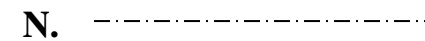
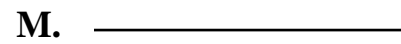
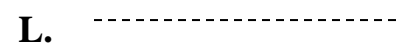
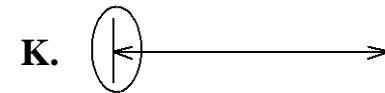
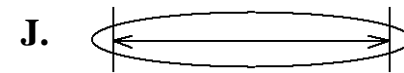
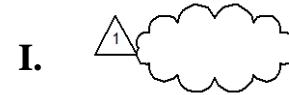
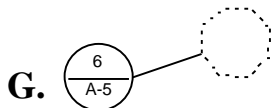
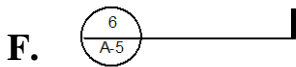
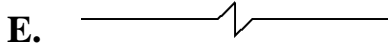
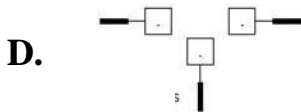
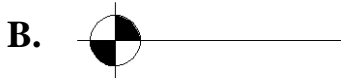


## Chapter 2

### Symbol and Line Exercise #1

**Directions:** Match the following lines and symbols to the list provided.

- |                             |                             |
|-----------------------------|-----------------------------|
| 1. _____ Break Line         | 9. _____ Extension Line     |
| 2. _____ Hidden Line        | 10. _____ Dimension Line    |
| 3. _____ Elevation Callout  | 11. _____ Revision Block    |
| 4. _____ Cutting Plane Line | 12. _____ Leader Line       |
| 5. _____ Revision Symbol    | 13. _____ Partition Callout |
| 6. _____ Detail Callout     | 14. _____ Elevation Symbol  |
| 7. _____ Object Line        | 15. _____ Title Block       |
| 8. _____ Center Line        | 16. _____ North Arrow       |

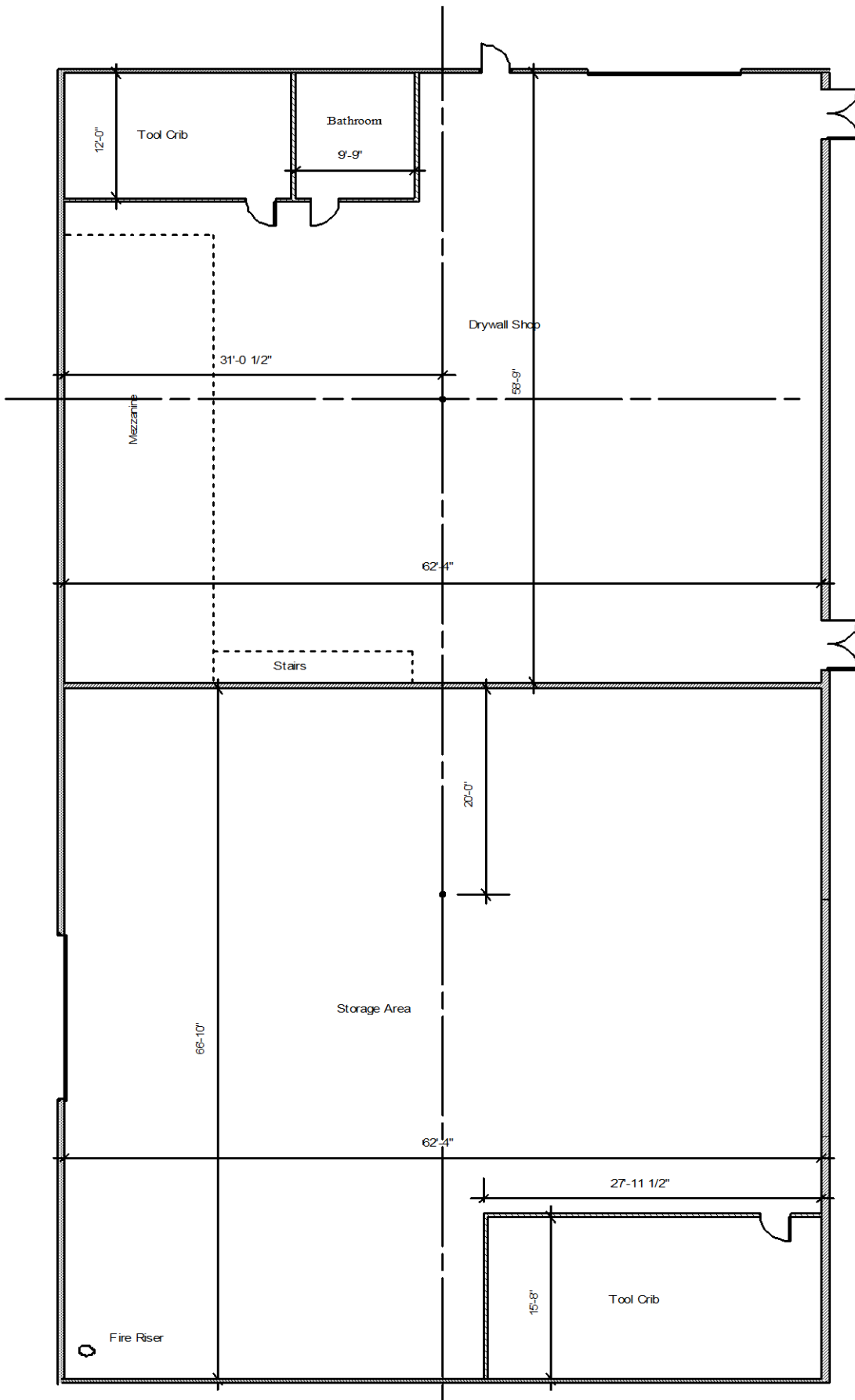


**O.**




	Revision

**P.**

DRN. BY	DATE	SCALE		
EXD. BY	DATE			



Wall Legend:

-  Interior Partition +/- 96"
-  Interior Full Height Partition
-  Exterior Concrete Wall

Floor Plan for  
Blueprint Reading  
Exercise 2



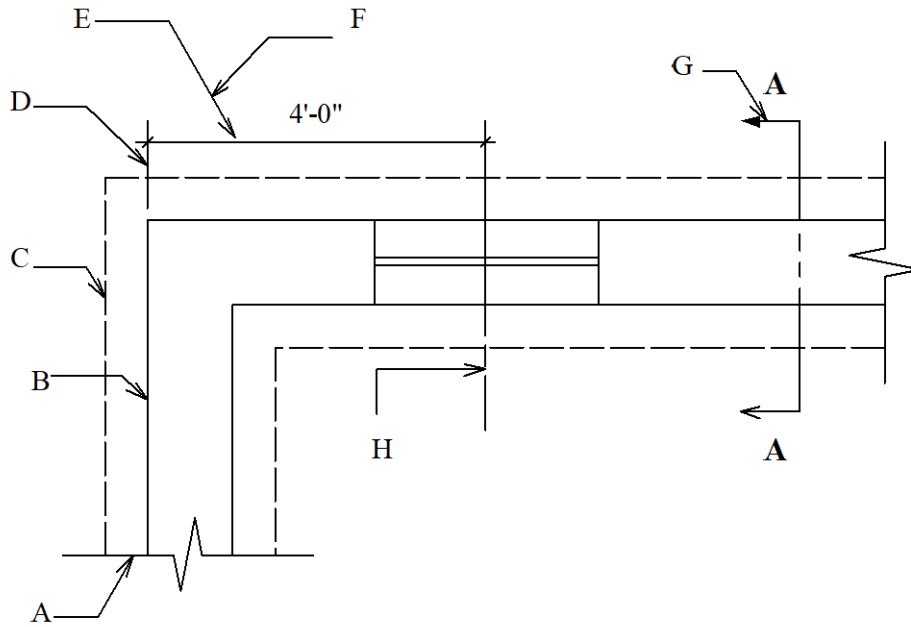
**Chapter 2**  
**Blueprint Reading Exercise #2**

**Directions:** Answer the following questions using the floor plan shown on the previous page. Mark your answers on the **bubble answer sheet**.

- 1). Based on the North arrow, what exterior walls have the rollup doors?
  - A) South & North
  - B) West & North
  - C) East & South
  - D) West & South
  
- 2). What is the hidden line referring to?
  - A) Tool Crib
  - B) Storage Area
  - C) Mezzanine
  - D) Fire Riser
  
- 3). What are the dimensions of the Bathroom?
  - A) 9'-9" x 12'-0"
  - B) 15'-8" x 27'-11 1/2"
  - C) 66'-10" x 62'-4"
  - D) None of the above
  
- 4). What corner of the building is the fire riser located?
  - A) Northwest
  - B) Southeast
  - C) Southwest
  - D) Northeast
  
- 5). From the North exterior wall, what is the dimension shown to the wall separating the Drywall Shop from the Storage Area?
  - A) 66'-10"
  - B) 20'-0"
  - C) 58'-9"
  - D) 62'-4"

- 6). What are the inside measurements of this building?
- A) 62'-4" x 125'-7"
  - B) 62'4" x 58'-9"
  - C) 31'-0 1/2" x 58'-9"
  - D) 62'-4" x 66-10"
- 7). How many door openings would be shown in the East exterior elevation?
- A) 1
  - B) 2
  - C) 3
  - D) 6
- 8). How many door openings would be shown in the North interior elevation, including the rollup door?
- A) 2
  - B) 3
  - C) 4
  - D) 5
- 9). How many windows are shown?
- A) 2
  - B) 1
  - C) 6
  - D) None
- 10). How far is the West exterior wall from the centerline of the column?
- A) 62'-4"
  - B) 31'-0 1/2"
  - C) 20'-0"
  - D) 58'-9"

Chapter 2  
Line Identification  
Exercise #3



Directions: Match the letter to the type of line shown.

- |                         |                             |
|-------------------------|-----------------------------|
| 1. _____ Break Line     | 5. _____ Dimension Line     |
| 2. _____ Object Line    | 6. _____ Leader             |
| 3. _____ Hidden Line    | 7. _____ Cutting Plane Line |
| 4. _____ Extension Line | 8. _____ Center Line        |



## Chapter 3 Scales and Dimensioning

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Objectives:

At the end of this chapter, students will be able to:

- 1). Understand the architectural scale.
- 2). Identify the various scales used for construction drawings.
- 3). Comprehend dimensioning techniques used on construction drawings.

### Scale

If construction projects were drawn full size, you would need paper as large as the building being built. Therefore everything is reduced before it is drawn. To maintain proportions with other parts of the building, the object is drawn to a scale. For example, a scale of  $1/8'' = 1'-0''$  means that every  $1/8''$  on the plan represents  $1'-0''$  of the actual building. Another way to think of this is  $1/8''$  scale is  $1/96$  size (there are ninety six units of  $1/8$  inch in 12 inches). Scales for detail drawings will range from  $1/2'' = 1'-0''$  to full scale, whereas elevations and section drawings could be  $1/4'' = 1'-0''$ .

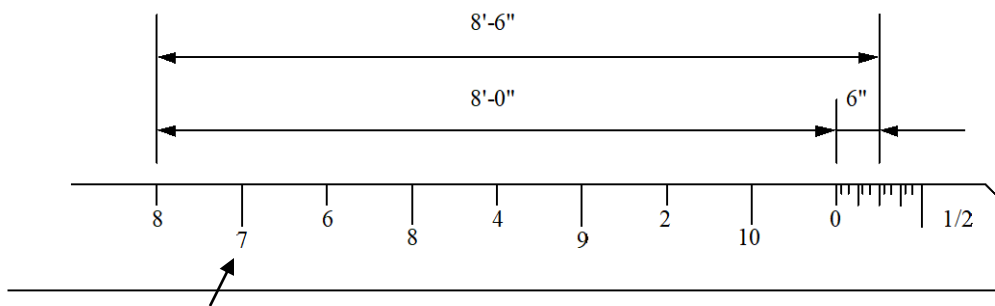
The scale of a drawing will be indicated on the sheet, either in the title block or beneath the drawing or detail itself. A customary example will look like: SCALE :  $1/8'' = 1'-0''$ . The most common scale used for commercial floor plans is  $1/8'' = 1'-0''$ , primarily due to the size of commercial buildings and the need to fit the entire drawing on one page.

It should be noted that a good drawing would include all necessary dimensions. However, if you are required to “scale” a drawing to obtain a measurement, such measurements should be crosschecked with other dimensions to verify the accuracy or a better procedure is to request the dimension from the general contractor or architect. Using scaled dimensions is a risky proposition.

The term “scale” is also used for the measuring instrument (ruler) the architect uses when drafting blueprints. Available to the architect are ten different drawing scales on the ruler. Reading an architects scale is a simple process and using the following steps will illustrate the process.

## Reading A Scale

1. Locate the proper scale used for your particular measurement.
2. Notice that your scale has the measurements of feet marked and can be read from both right to left and left to right. Some measurements will read feet in increments of one foot, some two feet and others in four feet. Inches will be marked to the left or right of 0, depending on which scale you are using.
3. If you wanted to draw a line for example, 8'-6" long using the 1/2" scale, find 8' (top of scale, lower numbers are the 1" scale coming from the left) and draw the line to the right from 8' past 0 and on to 6".

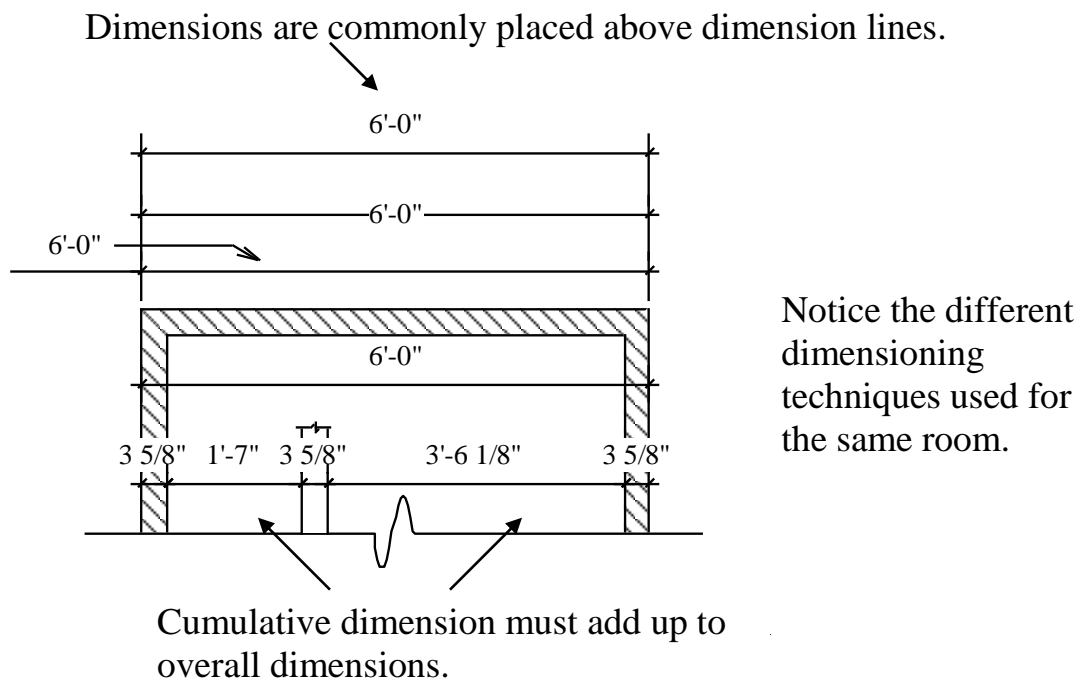


Lower numbers are the 1" scale coming from the left.

An architect's scale is preferred when taking a measurement from a drawing, but your tape measure will work also. A measurement could be scaled from a drawing fairly easily, but you first must identify the scale of the drawing. For example, if a drawing is  $1/8'' = 1'-0''$ , using your tape measure we would know that every  $1/8''$  represents  $1'-0''$ , so if the distance measured was  $1\ 5/8''$ , this would correspond to  $13'-0''$  ( $1\ 5/8''$  equals a total of thirteen  $1/8''$ 's). This process works for most scales that are multiples of  $1/8''$ . Again, it is not recommended to scale a drawing; the written dimension will **always** take precedence over a scaled dimension.

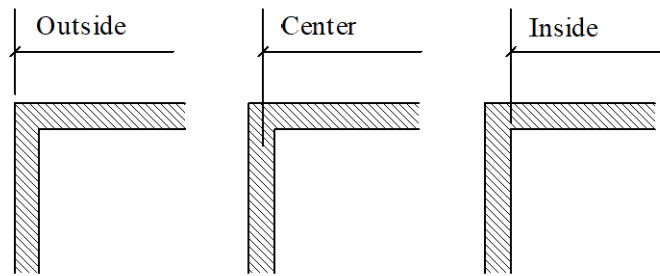
## Dimensioning Techniques

The drywall/lather will need to know some basic rules for reading dimensions. It is a preference of the individual architect or draftsman whether they use a tick, dot or arrowhead when terminating a dimension line. Dimensions are shown to locate points from other points on the prints. The extension lines or leaders are drawn so that the point of reference is clear. The dimension can be placed above the dimension line, or within the dimension line and sometimes outside of the extension lines with the use of a leader line pointing to the dimension line, (as shown below). Not all dimensions will be pulled away from the drawing with extension lines, they may also be placed within the room or drawing. Dimensions should be shown in each room on a floor plan giving its exact size, location and the size relationship to other objects.



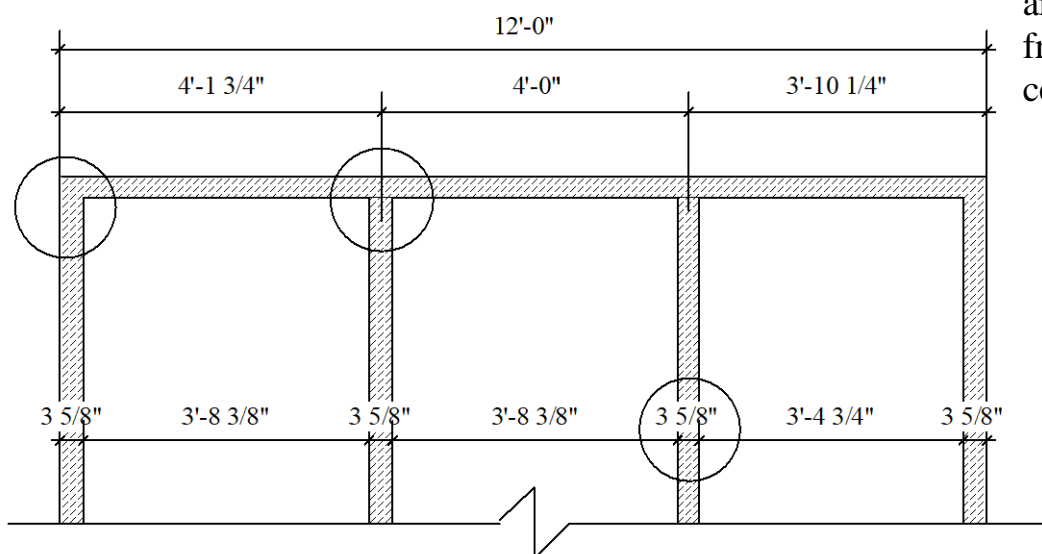
The extension lines or the termination of the dimension line should be carefully studied. The drywall/lather must understand what side of the wall or center of the wall these lines are originating or terminating for proper layout. When finish dimensions are shown over a series of rooms across the building, a significant cumulative error will occur in the last room if the finishes are not accounted for.

## Extension Lines



In the diagram above, note where the extension line is originating for the three walls. You have the outside, center and inside faces of the wall shown. When the partition layout is performed, significant errors could occur if the extension lines are not followed properly.

Dimensioning techniques used by architects when using frame line dimensions. These dimensions are to frame and centers as shown within the highlighted circles, as shown below.

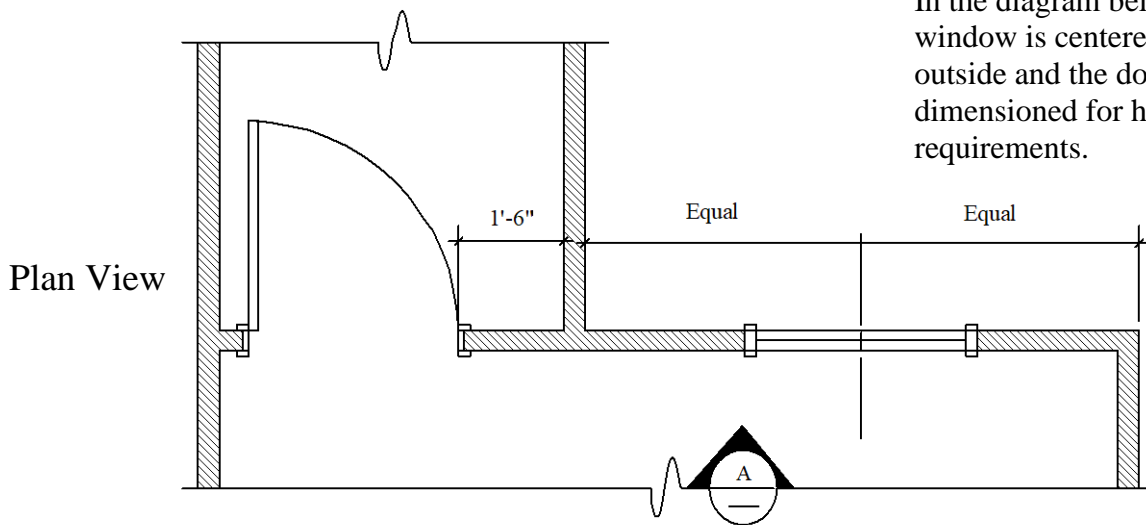


Note:  
All dimensions are to frame or center line.

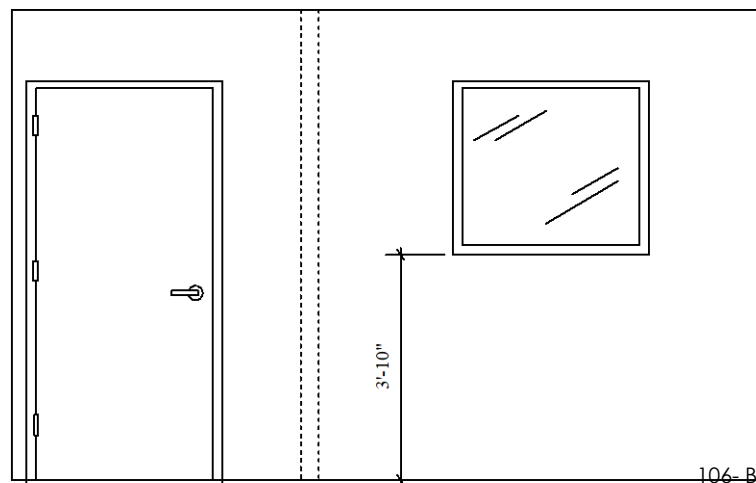
Doors can be dimensioned to either the edge of the opening or to the center of the opening. In residential construction it is usually to the center, but in commercial construction it could be to the center or to the edge of the opening. Various handicap code requirements will stipulate a minimum clear dimension to the edge of doors from walls, cabinetry, columns, etc. Many times there will not be any dimension given for a door and in this case, if the door swings flat against the wall, general practice is to give the door leg a 4" measurement from the inside face of the track, then the required rough opening is measured from the 4" mark of the door leg.

Windows are not typically dimensioned to a layout (edge or center) when shown on an interior floor plan, believe it or not. This is not to say they will never be, but most architects prefer the windows to be centered between walls or from the edge of the door and a sidewall. What is important is the sill or header height for a window. We know what type of view would show that, right? If the windows look centered, then center them. The preference would be to center them from the outside of the room looking in. If the job were exterior framing for a building, the window locations both horizontally and vertically, would positively be dimensioned.

In the diagram below, the window is centered from the outside and the door is dimensioned for handicap requirements.

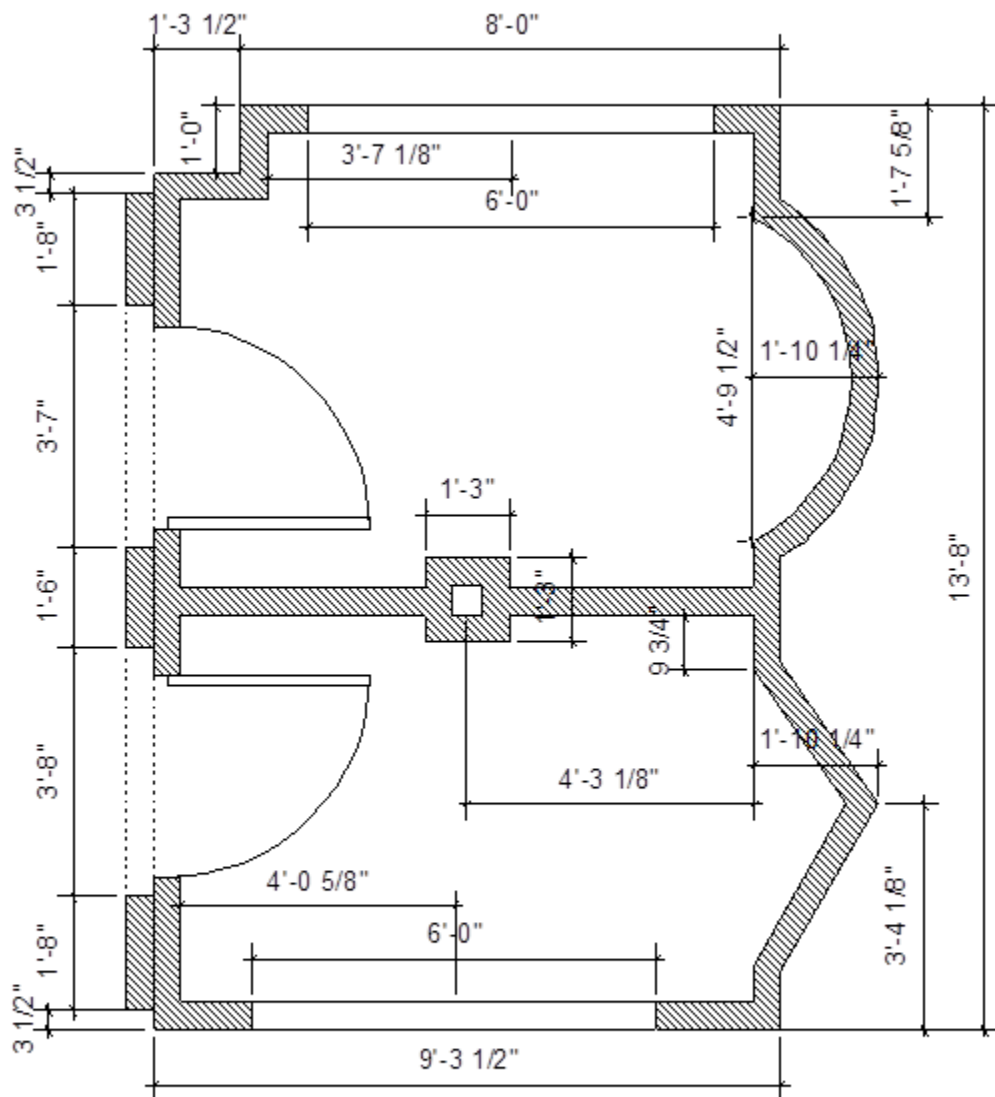


Elevation View



## An example of finished dimensions

Reading the general notes below the drawing determines the finished wall thickness.



### Notes:

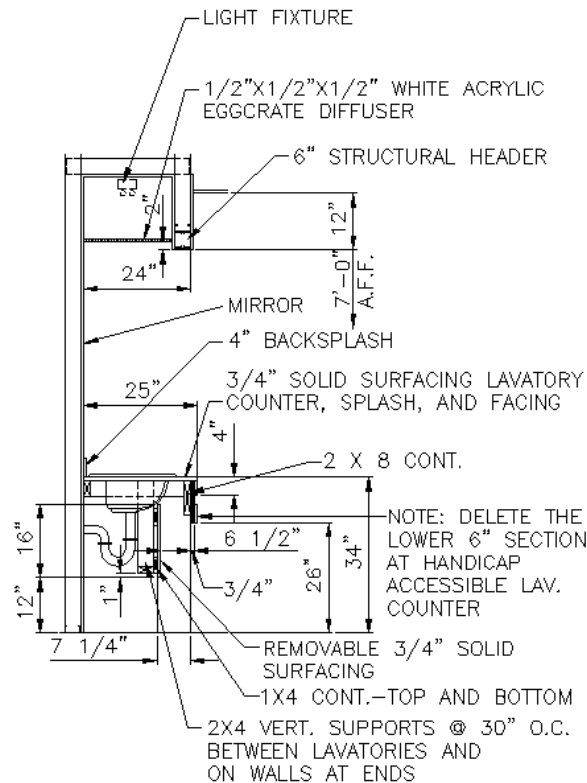
- 1) All Dimensions Are To Finish
- 2) All Walls Are 47/8" Finish, 35/8" Stud With 5/8" Gypsum Board Each Side.
- 3) All Doors Are 3' x 6'-8", Aluminum Frames, Centered In Opening.

## Dimensioning of Elevation or Section Drawings

Vertical dimensions can be found on elevation, section and detail drawings. Mounting heights for grab bars, sill heights of windows and ceiling heights are some of the examples of vertical dimensions given on elevation and section drawings, which could not be found on plan views. The elevation symbol may or may not be used with the vertical dimension.

Elevation and section drawings are used to show materials and their placement, for example an expansion joint in a lath and plaster wall or reveal metal in a drywall partition. Information about the materials is provided through the use of notes placed on the elevation drawing.

In the section drawing below, note the vertical dimensions given. The bottom of the header is 7'-0" above finished floor (AFF). The ceiling will be 12" above the bottom of the header and the acrylic egg crate diffuser is to be mounted 2" above the bottom of the header. The top of the counter is 34" above the floor. Also shown, are some horizontal dimensions. The soffit is 24" from the back wall to the outside edge and the counter top is 25" wide. Understanding where to find information is an important element to reading blueprints.



Examples of vertical and horizontal dimensions found on a section view.

LAVATORY  
W/ RECESSED LIGHT

SCALE: 1/2" = 1' - 0"

## Chapter 3

### Study Guide

**Directions:** Answer the following questions using the ***bubble answer sheet***.

- 1). The best place in a set of prints to look for window sill heights would be the floor plan.
  - A) True
  - B) False
  
- 2). The scale  $\frac{1}{4}'' = 1'-0''$  is understood as:
  - A) 1/96 size
  - B) 1/48 size
  - C) 1/8 size
  - D) 1/24 size
  
- 3). The term “scale” is also used for the measuring instrument (ruler) the architect uses when drafting blueprints.
  - A) True
  - B) False
  
- 4). Cumulative dimensions within a room must add up to the overall dimension of the room, when given.
  - A) True
  - B) False
  
- 5). Dimensions can be:
  - A) Placed above the dimension line.
  - B) Placed within the dimension line.
  - C) Placed outside of the dimension line, with the use of a leader line.
  - D) All of the above.
  
- 6). Dimensions are shown to locate points from other points on the prints.
  - A) True
  - B) False



- 7). Extensions lines can originate from:
- A) Outside face of a wall.
  - B) Center of a wall.
  - C) Inside face of a wall.
  - D) All of the above.
- 8). The drywall/lather must understand what side of the wall or center of the wall the extension/dimension lines are originating for proper layout.
- A) True
  - B) False
- 9). An architects scale may be read from:
- A) Left to right
  - B) Right to left
  - C) Both A and B
  - D) None of the above
- 10). Dimensions on a print show \_\_\_\_\_.
- A) Size
  - B) Location
  - C) Size relationship of parts
  - D) All of the above

Chapter # 3  
Scaling Exercise #1

Exercise 1:

**In the right margin of this sheet, draw a line 5 inches long, using the 16 Scale. Place thin, short extension lines at each end.**

**Using each of the indicated scales, record the measured length of the line and its scale ratio in space provided.**

Architect's Scale	Scale Ratio	Measured Line Length
<b>16 Scale (1"=1")</b>	1:1	5"
<b>1 Scale (1"=1')</b>	_____	_____
<b>1/4 Scale (1/4"=1')</b>		
<b>3 Scale (3"=1')</b>		
<b>3/16 Scale (3/16"=1')</b>		

Exercise 2:

**In the right margin of this sheet, draw a line 4 inches long, using the 16 Scale. Place thin, short extension lines at each end.**

**Using each of the indicated scales, record the measured length of the line and its scale ratio in space provided.**

Architect's Scale	Scale Ratio	Measured Line Length
<b>16 Scale (1"=1")</b>	1:1	4"
<b>3/4 Scale 3/4"=1'</b>		
<b>1/8 Scale 1/8"=1'</b>		
<b>3/32 Scale 3/32"=1'</b>		
<b>1/2 Scale 1/2"=1'</b>		

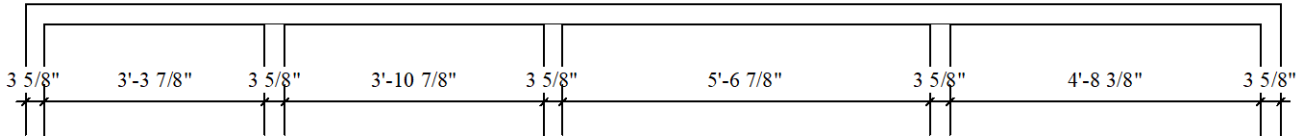
Exercise 3:

**Using the indicated scale, draw a horizontal line to the right of the distance shown. Place extension lines at each end.**

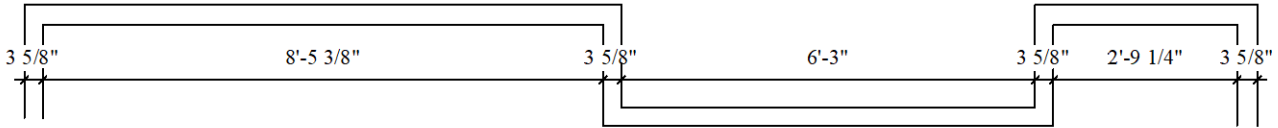
Architect's Scale	DISTANCE	Length of Line
<b>1/4 Scale</b>	9'-5"	
<b>3/4 Scale</b>	2'-4"	
<b>1/8 Scale</b>	18'-8"	
<b>3/32 Scale</b>	26'-0"	
<b>1 1/2 Scale</b>	1'- 7 3/4"	
<b>1/2 Scale</b>	5'-10"	

A

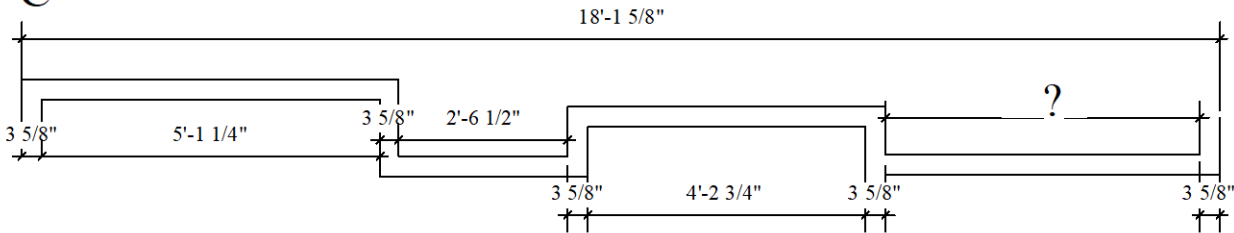
Cumulative Dimension Exercise #2



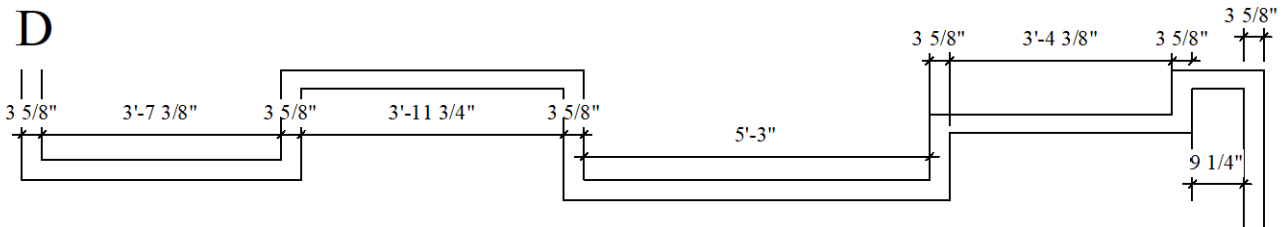
B



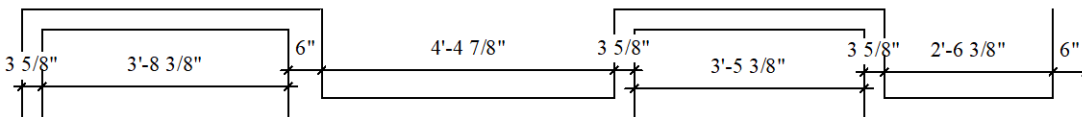
C



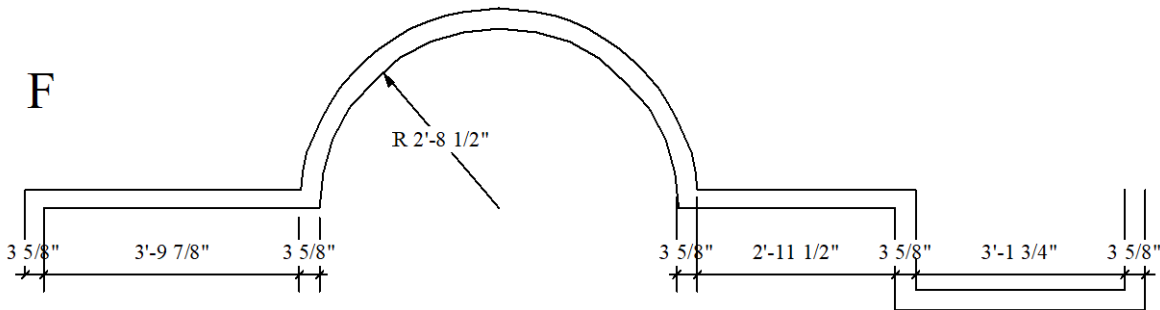
D



E



F



Directions: Find the cumulative or missing dimension for A thru F.

A. \_\_\_\_\_

D. \_\_\_\_\_

B. \_\_\_\_\_

E. \_\_\_\_\_

C. \_\_\_\_\_

F. \_\_\_\_\_

## **Chapter 4 Bluebeam – Introduction**

### **Course Objective**

In this course, the UBC member will have a good understanding of how Bluebeam works in relation to blueprints. There will be a brief tutorial on how to use a mobile device such as an iPad on the job. The student will see how the technology used correctly can boost productivity on the job.

### **Specific Objective**

Upon completion of this unit, the student will be able to:

1. Understand how to use a mobile device on the job site.
2. Understand the basics of Bluebeam and how it can be effectively used on a job site.
3. See the benefits of using such technology on the job site when it comes to productivity and communication.

On a job site, productivity is key to successful job completion. As a tradesperson, there are certain tools that we use to get things done. If we don't have the right tool for the job, and we try to make it work just by using what we have available to us, it doesn't always work the way we want it to and will cost us more time and money in the end. More and more Contractors and subcontractors are starting to go digital, and programs like Bluebeam are now being implemented in the field. The Bluebeam program is designed to save time, improve communications, increase efficiency and increase overall productivity on the job. Bluebeam is being used for creating PDF's, editing documents, document sharing, creating markups, and as a very effective collaboration tool. As new technologies are developed to help streamline the construction industry, The Carpenters Training Committee for Northern California would like to help our members develop skills that will allow them to keep up with the changing times.

When it comes to blueprint reading, most of us are comfortable with paper copies that we can have in front of us and be able to see and feel. It can be likened to reading a book. Some feel more comfortable reading a hard copy of a book when they can turn the actual pages. However, in both cases, it can be much more convenient to have access to the prints, or book, on a mobile device that you can carry with you anywhere. Regular paper prints are susceptible to damage from rain, wind and dirt, and special care must be taken to keep them in good condition. They can also be bulky, hard to carry around, expensive to print and take up a lot of space. Digital prints, however, can be stored in the cloud or on a mobile device which can be fitted with a protective case to prevent damage. Using a mobile device on a job site is like having the right tool for the job. It makes getting the job done much easier and, in most cases, more efficiently. This does not mean that paper prints will be eliminated from the job completely. There should always be a record set of paper prints kept in the office or job trailer as backup.

## **Mobile Devices**

Most of us are familiar with using a mobile device, whether it's a lap top, smart phone or tablet. It may have taken us a while before we understood the full potential of the device. However, once we learned how to use it, it became second nature to us. Whenever a new product becomes available or its time to upgrade, we realized that even though it may be made by a different manufacturer, it functioned basically the same as the old one. So, we shouldn't be intimidated by a new piece of technology just because we've never seen it before. Many contractors use iPads in the field because they are easy to use, so we will be using iPads with Bluebeam for this class.

The first step is to turn it on. Hold the button on the top right corner of the device for about 3 seconds, or until it turns on. If you have a passcode set up on your device, the screen should prompt you to enter that code now. Once the code has been entered, the home screen will appear. The home screen will have some apps on it that are pre-loaded onto the device. If you swipe your finger horizontally across the screen, you will be taken to other screens that will have more apps on it. If you don't see the app you are looking for on the first screen, simply swipe to the next screen to find it.

## Starting Bluebeam

Bluebeam is a program in which we can read a digital form of a set of blueprints. It's easy to use but, like anything, takes practice to really feel comfortable using it. We'll go step by step on how to join a project that a contractor, or architect, has started on Bluebeam. Once the project has been started, the contractor or subcontractor can view the documents whenever they want to.

1. Tap the Bluebeam Revu icon on the home screen to open it.



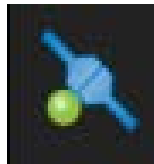
2. Find the Studio icon in the top left corner of the screen and tap it.
3. You will see a Plug with a dot next to it.



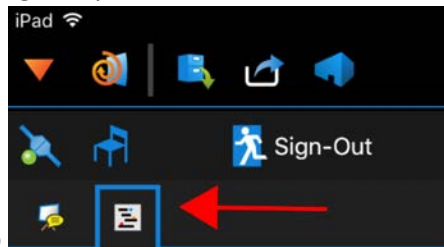
- a. If the dot is red you are disconnected. Tap it to connect.



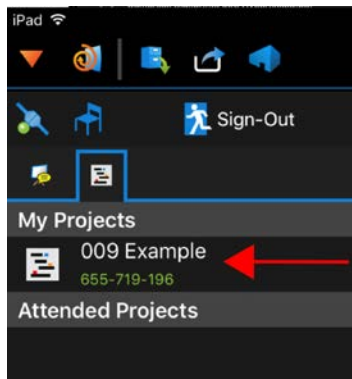
- b. When the dot is green you are connected.



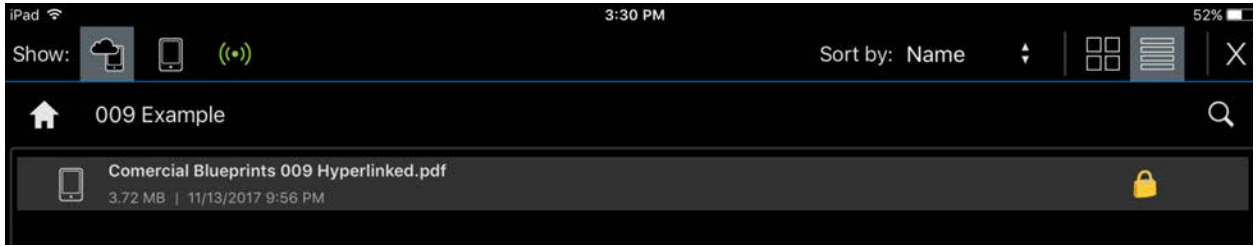
4. Tap on the Projects tab



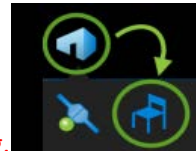
5. Under My Projects tap the 009 project



6. A new window will open. Tap the project PDF to start the download.



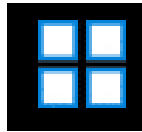
7. If there are no projects under the My Projects tab. You will have to join one.



- a. Tap the Chair icon next to the connection plug.
- b. Type in the Studio ID the instructor, or contractor, has given you. Tap join. (You do not need to enter the dashes)



8. Once you are in a Project you can tap the Tab Access icon in the top left corner.
  - a. 4 new tabs will open underneath Tab Access.



9. Tap the Thumbnails tab.

- a. This will give you thumbnails for all the pages in the prints.
- b. The Sheet labels are on the bottom of the thumbnails to identify each sheet.
- c. You can swipe up and down on the thumbnails to navigate through the pages.
- d. To select a page tap it, and it will take you to the page on the main screen.
- e. On the main screen, you can swipe left and right to flip through the pages as long as you are zoomed all the way out on the page.
  - i. You can also use the arrows on the command bar to navigate through the pages.



10. Explore the pages with fingers gestures

- a. Stretch two fingers on the main screen to zoom in on the page. Or double tap on the page.
- b. When zoomed in you can swipe up, down left and right to navigate the page.
- c. Pinch two fingers to zoom out.

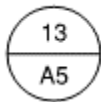
One thing you should notice right away about using a device for blueprint reading is the clarity and brightness of the image. The drawings are a digital image produced by the architect and put directly into Bluebeam. There will not be any smudges or “markups” on them. **Markups** are a way for contractors to communicate with engineers and subcontractors.

### Using Bluebeam in the Field

Reading blueprints is a skill that must be learned for a carpenter to be successful on the job site. Once this skill is refined, it’s an easy transition to reading blueprints in a digital format. Using a digital form of blueprints will make your job easier and take less time. Many industry leaders claim to have saved 30% more time reading digital blueprints compared to paper copies. One reason for the time savings is that the superintendents and foremen do not have to travel to the job site trailer to look at the prints and talk about solutions and then go back out to the field and try to explain to the workers what they need to do. Having the digital prints in their pocket saves travel time. Another reason for the time savings is because the contractor can communicate and collaborate with countless others who are involved with the project via the Bluebeam software. They can do this right from the job site. Traditionally, requests for information (RFI) would be sent by email and then the contractor would have to wait for a response before proceeding with the work. Through Bluebeam, questions and answers can be handled simultaneously while looking at the drawings together in two different places anywhere in the world.

Another thing that saves time by using digital blueprints is hyperlinked details. With paper prints, the carpenter must flip pages, sometimes so many he may forget where he started. With hyperlinked details, the carpenter simply touches the detail on the screen and he is instantly transferred to the detail on whatever page it’s on.

- a. If you tap on a callout. This will take you to the page and detail that it is referencing.



- i. For example: If you tap this call out, it will take you to sheet A5, Detail number 13.
- b. To navigate between sheets and callouts, use the command bar at the top of the screen



- c. To go back to the page you were previously on: tap the back arrow







d. To return to the detail push the forward arrow.

i. This tip is a time saver. You don't necessarily have to remember which detail it was or what page you were on previously. Bluebeam stores your last moves in its memory.

Now, we can see the efficiency of using Bluebeam in our everyday use on the construction site. There is so much more the software can do. We are just scratching the surface, but, we have a good base knowledge of how the software works with blueprints.

11. At the end of the class, close all windows and tap the home button on the iPad to exit out of Bluebeam.
12. Hold down the power button on the top side of the iPad until it says slide to power off on the screen. Slide the power button to shut off the iPad.
13. Make sure to sign your iPad back in and charge them overnight.

## Construction Terminology

**A/C**- An abbreviation for air conditioner or air conditioning.

**Air space** - The area between insulation facing and interior of exterior wall coverings. Normally a 1" air gap.

**Allowance(s)** - A sum of money set aside in the construction contract for items which have not been selected and specified in the construction contract. For example, selection of tile as a flooring may require an allowance for an underlayment material, or an electrical allowance which sets aside an amount of money to be spent on electrical fixtures.

**Anchor bolts**- Bolts to secure a wooden sill plate to concrete, or masonry floor or wall.

**Architect** - One who has completed a course of study in building and design, and is licensed by the state as an architect. One who draws up plans.

**Back Charge**- Billings for work performed or costs incurred by one party that, in accordance with the agreement, should have been performed or incurred by the party to whom billed. Owners bill back charges to general contractors, and general contractors bill back charges to subcontractors. Examples of back charges include charges for cleanup work or to repair something damaged by another subcontractor, such as a tub chip or broken window.

**Backfill**- The replacement of excavated earth into a trench around or against a basement /crawl space foundationwall.

**Backing**- Frame lumber installed between the wall studs to give additional support for drywall or an interior trim related item, such as handrail brackets, cabinets, and towel bars. In this way, items are screwed and mounted into solid wood rather than weak drywall that may allow the item to break loose from the wall. **Carpet backing** holds the pile fabric in place.

**Ballast**- A transformer that steps up the voltage in a florescent lamp.

**Balloon framed wall-** Framed walls (generally over 10' tall) that run the entire vertical length from the floor sill plate to the roof. This is done to eliminate the need for a gable end truss.

**Balusters-** Vertical members in a railing used between a top rail and bottom rail or the stair treads. Sometimes referred to as 'pickets' or 'spindles'.

**Balustrade-** The rail, posts and vertical balusters along the edge of a stairway or elevated walkway.

**Batt** - A section of fiber-glass or rock-wool insulation measuring 15 or 23 inches wide by four to eight feet long and various thickness'. Sometimes "faced" (meaning to have a paper covering on one side) or "unfaced" (without paper).

**Beam-** A structural member transversely supporting a load. A structural member carrying building loads (weight) from one support to another. Sometimes called a "girder".

**Bearing partition-** A partition that supports any vertical load in addition to its own weight.

**Bearing point-** A point where a bearing or structural weight is concentrated and transferred to the foundation

**Bearing wall-** A wall that supports any vertical load in addition to its own weight.

**Bearing header-** (a) A beam placed perpendicular to joists and to which joists are nailed in framing for a chimney, stairway, or other opening. (b) A wood lintel. (c) The horizontal structural member over an opening (for example over a door or window).

**Bid-** A formal offer by a contractor, in accordance with specifications for a project, to do all or a phase of the work at a certain price in accordance with the terms and conditions stated in the offer.

**Bid bond-** A bond issued by a surety on behalf of a contractor that provides assurance to the recipient of the contractor's bid that, if the bid is accepted, the contractor will execute a contract and provide a performance bond. Under the bond, the surety is obligated to pay the recipient of the bid the difference between the contractor's bid and the bid of the next lowest responsible bidder if the bid is accepted and the contractor fails to execute a contract or to provide a performance bond.

**Bid security** Funds or a bid bond submitted with a bid as a guarantee to the recipient of the bid that the contractor, if awarded the contract, will execute the contract in accordance with the bidding requirements of the contract documents.

**Bid shopping-** A practice by which contractors, both before and after their bids are submitted, attempt to obtain prices from potential subcontractors and material suppliers that are lower than the contractors' original estimates on which their bids are based, or after a contract is awarded, seek to induce subcontractors to reduce the subcontract price included in the bid.

**Bidding requirements-** The procedures and conditions for the submission of bids. The requirements are included in documents, such as the notice to bidders, advertisements for bids, instructions to bidders, invitations to bid, and sample bid forms.

**Blocking-** Small wood pieces to brace framing members or to provide a nailing base for gypsum board or paneling.

**Block out-** To install a box or barrier within a foundation wall to prevent the concrete from entering an area. For example, foundation walls are sometimes "blocked" in order for mechanical pipes to pass through the wall, to install a crawl space door, and to depress the concrete at a garage door location.

**Blue print(s) -** A type of copying method often used for architectural drawings. Usually used to describe the drawing of a structure which is prepared by an architect or designer for the purpose of design and planning, estimating, securing permits and actual construction.

**Bottom chord -** The lower or bottom horizontal member of a truss.

**Breaker panel-** The electrical box that distributes electric power entering the home to each branch circuit (each plug and switch) and composed of circuit breakers.

**Bridging-** Small wood or metal members that are inserted in a diagonal position between the floor joists or rafters at mid-span for the purpose of bracing the joists/rafters & spreading the load.

**Building codes-** Community ordinances governing the manner in which a building may be constructed or modified.

**Building paper-** A general term for papers, felts, and similar sheet materials used in buildings without reference to their properties or uses. Generally, comes in long rolls.

**Bull nose (drywall)-** Rounded drywall corners.

**CO-** An abbreviation for "**Certificate of Occupancy**". This certificate is issued by the local municipality and is required before anyone can occupy and live within the home. It is issued only after the local municipality has made all inspections and all monies and fees have been paid.

**Cantilever-** An overhang. Where one floor extends beyond and over a foundation wall. For example, at a fireplace location or bay window cantilever. Normally, not extending over 2 feet.

**Ceiling joist-** One of a series of parallel framing members used to support ceiling loads and supported in turn by larger beams, girders or bearing walls. Also called roof joists.

**Change order-** A written document which modifies the plans and specifications and/or the price of the construction Contract.

**Circuit-** The path of electrical flow from a power source through an outlet and back to ground.

**Circuit Breaker-** A device which looks like a switch and is usually located inside the electrical breaker panel or circuit breaker box. It is designed to (1) shut off the power to portions or all of the house and (2) to limit the amount of power flowing through a circuit (measured in amperes).

110 volt household circuits require a fuse or circuit breaker with a rating of 15 or a maximum of 20 amps. 220 volt circuits may be designed for higher amperage loads e.g. a hot water heater may be designed for a 30 amp load and would therefore need a 30 amp fuse or breaker.

**Cold air return-** The ductwork (and related grills) that carries room air back to the furnace for re-heating.

**Column-** A vertical structural compression member which supports loads.

**Compression web-** A member of a truss system which connects the bottom and top chords and which provides downward support.

**Construction Contract** - A legal document which specifies the what-when-where-how-how much and by whom in a construction project. A good construction contract will include:

1. The contractors registration number.
2. A statement of work quality such as 'Standard Practices of the Trades' or 'according to Manufacturers Specifications'.
3. A set of Blue Prints or Plans
4. A construction timetable including starting and completion dates.
5. A set of Specifications
6. A Fixed Price for the work, or a Time and Materials formula.
7. A Payment Schedule.
8. Any Allowances.

**Contractor-** A company licensed to perform certain types of construction activities. In most states, the general contractor's license and some specialty contractor's licenses don't require of compliance with bonding, workmen's compensation and similar regulations. Some of the specialty contractor licenses involve extensive training, testing and/or insurance requirements. There are various types of contractors:

- General contractor - responsible for the execution, supervision and overall coordination of a project and may also perform some of the individual construction tasks. Most general contractors are not licensed to perform all specialty trades and must hire specialty contractors for such tasks, e.g. electrical, plumbing.

- Remodeling contractor - a general contractor who specializes in remodeling work.
- Specialty contractor - licensed to perform a specialty task e.g. electrical, side sewer, asbestos abatement.
- Sub contractor - a general or specialty contractor who works for another general contractor.

**Control joint-** Tooled, straight grooves made on concrete floors to "control" where the concrete should crack

**Corner bead-** A strip of formed sheet metal placed on outside corners of drywall before applying drywall 'mud'.

**Course-** A row of shingles or roll roofing running the length of the roof. Parallel layers of building materials such as bricks, or siding laid up horizontally.

**Cricket-** A second roof built on top of the primary roof to increase the slope of the roof or valley. A saddle-shaped, peaked construction connecting a sloping roof with a chimney. Designed to encourage water drainage away from the chimney joint.

**Cross bridging-** Diagonal bracing between adjacent floor joists, placed near the center of the joist span to prevent joists from twisting.

**Dedicated circuit-** An electrical circuit that serves only one appliance (i.e., dishwasher) or a series of electric heaters or smoke detectors  
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**Delamination-** Separation of the plies in a panel due to failure of the adhesive. Usually caused by excessive moisture.

**Drywall (or Gypsum Wallboard (GWB), Sheet rock or Plasterboard)-** Wall board or gypsum- A manufactured panel made out of gypsum plaster and encased in a thin cardboard. Usually 1/2" thick and 4' x 8' or 4' x 12' in size. The panels are nailed or screwed onto the framing and the joints are taped and covered with a 'joint compound'.

'Green board' type drywall has a greater resistance to moisture than regular (white) plasterboard and is used in bathrooms and other "wet areas".

**Ducts-** The heating system. Usually round or rectangular metal pipes installed for distributing warm (or cold) air from the furnace to rooms in the home. Also, a tunnel made of galvanized metal or rigid fiberglass, which carries air from the heater or ventilation opening to the rooms in a building.

**Dura board, dura rock-** A panel made out of concrete and fiberglass usually used as a ceramic tile backing material. Commonly used on bathtub decks. Sometimes called Wonder board

**Easement-** A formal contract which allows a party to use another party's property for a specific purpose. e.g. A sewer easement might allow one party to run a sewer line through a neighbor's property.

**Electrical Rough-** Work performed by the Electrical Contractor after the plumber and heating contractor are complete with their phase of work. Normally all electrical wires, and outlet, switch, and fixture boxes are installed (before insulation).

**Elevation sheet-** The page on the blue prints that depicts the house or room as if a vertical plane were passed through the structure.

**Estimating-** The process of calculating the cost of a project. This can be a formal and exact process or a quick and imprecise process.

**Expansion joint-** Fibrous material (@1/2" thick) installed in and around a concrete slab to permit it to move up and down (seasonally) along the non-moving foundation wall.

**Extras-** Additional work requested of a contractor, not included in the original plan, which will be billed separately and will not alter the original contract amount but increase the cost of building the home.

**Face nail-** To install nails into the vertical face of a bearing header or beam.

**Field measure-** To take measurements (cabinets, countertops, stairs, shower doors, etc.) in the home itself instead of using the blueprints.



**Fire-resistive or Fire rated-** Applies to materials that are not combustible in the temperatures of ordinary fires and will withstand such fires for at least 1 hour. Drywall used in the garage and party walls are to be fire rated, 5/8", Type X.

**Fire retardant chemical-** A chemical or preparation of chemicals used to reduce the flammability of a material or to retard the spread of flame.

**Fire stop-** A solid, tight closure of a concealed space, placed to prevent the spread of fire and smoke through such a space. In a frame wall, this will usually consist of 2 by 4 cross blocking between studs. Work performed to slow the spread of fire and smoke in the walls and ceiling (behind the drywall). Includes stuffing wire holes in the top and bottom plates with insulation and installing blocks of wood between the wall studs at the drop soffit line. This is integral to passing a Rough Frame inspection. See also 'Fire block'.

**Frame Inspection-** The act of inspecting the home's structural integrity and its compliance to local municipal codes.

**GF C I, or G F I-** Ground Fault Circuit Interrupter- an ultra sensitive plug designed to shut off all electric current. Used in bathrooms, kitchens, exterior waterproof outlets, garage outlets, and "wet areas". Has a small reset button on the plug.

**General Contractor** A contractor who enters into a contract with the owner of a project for the construction of the project and who takes full responsibility for its completion, although the contractor may enter into subcontracts with others for the performance of specific parts or phases of the project.

**Girder-** A large or principal beam of wood or steel used to support concentrated loads at isolated points along its length.

**Glazing-** The process of installing glass, which commonly is secured with glazier's points and glazing compound.

**Grade-** Ground level, or the elevation at any given point. Also the work of leveling dirt. Also, the designated quality of a manufactured piece of wood.

**Grid-** The completed assembly of main and cross tees in a suspended ceiling system before the ceiling panels are installed. Also, the decorative slats (munton) installed between glass panels.

**Ground-** Refers to electricity's habit of seeking the shortest route to earth. Neutral wires carry it there in all circuits. An additional grounding wire or the sheathing of the metal-clad cable or conduit—protects against shock if the neutral leg is interrupted.

**Gyp board-** Drywall. Wall board or gypsum- A panel (normally 4' X 8', 10', 12', or 16') made with a core of Gypsum (chalk-like) rock, which covers interior walls and ceilings.

**Header-** (a) A beam placed perpendicular to joists and to which joists are nailed into framing for a chimney, stairway, or other opening. (b) A wood lintel. (c) The horizontal structural member over an opening (for example over a door or window).

**Home run (electrical)-** The electrical cable that carries power from the main circuit breaker panel to the first electrical box, plug, or switch in the circuit.

**Hot wire-** The wire that carries electrical energy to a receptacle or other device—in contrast to a neutral, which carries electricity away again. Normally the black wire. Also see ground.

**HVAC-** An abbreviation for **H**eat, **V**entilation, and **A**ir **C**onditioning

**I-beam-** A steel beam with a cross section resembling the letter **I**. It is used for long spans as basement beams or over wide wall openings, such as a double garage door, when wall and roof loads bear down on the opening

**Incandescent lamp-** A lamp employing an electrically charged metal filament that glows at white heat. A typical light bulb.

**Inside corner-** The point at which two walls form an internal angle, as in the corner of a room.

**J Channel-** Metal edging used on drywall to give the edge a better finished appearance when a wall is not "wrapped" Generally, basement stairway walls have drywall only on the stair side. J Channel is used on the vertical edge of the last drywall sheet

**Joint-** The location between the touching surfaces of two members or components joined and held together by nails, glue, cement, mortar, or other means.

**Joint cement or Joint compound-** A powder that is usually mixed with water and used for joint treatment in gypsum-wallboard finish. Often called "spackle" or drywall mud.

**Joist-** Wooden 2 X 8's, 10's, or 12's that run parallel to one another and support a floor or ceiling, and supported in turn by larger beams, girders, or bearing walls.

**King stud-** The vertical "2 X's" frame lumber (left and right) of a window or door opening and runs continuously from the bottom sole plate to the top plate.

**Landing-** A platform between flights of stairs or at the termination of a flight of stairs. Often used when stairs change direction. Normally no less than 3 ft. X 3 ft. square.

**Ledger (for a Structural Floor)-** The wooden perimeter frame lumber member that bolts onto the face of a foundation wall and supports the wood structural floor.

**Level-** True horizontal. Also, a tool used to determine level.

**Lintel-** A horizontal structural member that supports the load over an opening such as a door or window.

**Load bearing wall-** Includes all exterior walls and any interior wall that is aligned above a support beam or girder. Normally, any wall that has a double horizontal top plate.

**Lookout-** A short wood bracket or cantilever that supports an overhang portion of a roof.

**Lumens-** Unit of measure for total light output. The amount of light falling on a surface of one square foot.

**Manufacturer's specifications-** The written installation and/or maintenance instructions which are developed by the manufacturer of a product and which may have to be followed in order to maintain the product warrantee.

**Masonry-** Stone, brick, concrete, hollow-tile, concrete block, or other similar building units or materials. Normally bonded together with mortar to form a wall.

**Mastic-** A pasty material used as a cement (as for setting tile) or a protective coating (as for thermal insulation or waterproofing)

**Mechanics lien-** A lien on real property, created by statute in many years, in favor of persons supplying labor or materials for a building or structure, for the value of labor or materials supplied by them. In some jurisdictions, a mechanics lien also exists for the value of professional services. Clear title to the property cannot be obtained until the claim for the labor, materials, or professional services is settled. Timely filing is essential to support the encumbrance, and prescribed filing dates vary by jurisdiction.

**Metal lath-** Sheets of metal that are slit to form openings within the lath. Used as a plaster base for walls and ceilings and as reinforcing over other forms of plaster base.

**Millwork-** Generally all building materials made of finished wood and manufactured in millwork plants. Includes all doors, window and door frames, blinds, mantels, panel work, stairway components (balusters, rail, etc.), moldings, and interior trim. Does not include flooring, ceiling, or siding.

**Mortar-** A mixture of cement (or lime) with sand and water used in masonry work.

**Mullion-** A vertical divider in the frame between windows, doors, or other openings

**Nail inspection-** An inspection made by a municipal building inspector after the drywall material is hung with nails and screws (and before taping).

**NEC (National Electrical Code)**- A set of rules governing safe wiring methods. Local codes—which are backed by law—may differ from the NEC in some ways.

**Neutral wire**- Usually color-coded white, this carries electricity from an outlet back to the service panel. Also see hot wire and ground.

**Nonbearing wall**- A wall supporting no load other than its own weight.

**Nosing**- The projecting edge of a molding or drip or the front edge of a stair tread.

**O C- On Center**- The measurement of spacing for studs, rafters, and joists in a building from the center of one member to the center of the next.

**Outside corner**- The point at which two walls form an external angle, one you usually can walk around.

**Paper, building**- A general term for papers, felts, and similar sheet materials used in buildings without reference to their properties or uses. Generally, comes in long rolls.

**Parapet**- A wall placed at the edge of a roof to prevent people from falling off.

**Partition**- A wall that subdivides spaces within any story of a building or room.

**Penalty clause** - A provision in a contract that provides for a reduction in the amount otherwise payable under a contract to a contractor as a penalty for failure to meet deadlines or for failure of the project to meet contract specifications.

**Performance bond**- An amount of money (usually 10% of the total price of a job) that a contractor must put on deposit with a governmental agency as an insurance policy that guarantees the contractors' proper and timely completion of a project or job.

**Permeability**- A measure of the ease with which water penetrates a material.

**Permit** - A governmental municipal authorization to perform a building process as in:

- Zoning\Use permit - Authorization to use a property for a specific use e.g. a garage, a single-family residence etc.
- Demolition permit - Authorization to tear down and remove an existing structure.
- Grading permit - Authorization to change the contour of the land.
- Septic permit - A health department authorization to build or modify a septic system.
- Building permit - Authorization to build or modify a structure.
- Electrical permit - A separate permit required for most electrical work.
- Plumbing permit - A separate permit required for new plumbing and larger modifications of existing plumbing systems.

**Pigtails, electrical**- The electric cord that the electrician provides and installs on an appliance such as a garbage disposal, dishwasher, or range hood.

**Pier**- A column of masonry, usually rectangular in horizontal cross section, used to support other structural members. Also see Caisson.

**Pitch**- The incline slope of a roof or the ratio of the total rise to the total width of a house, i.e., a 6-foot rise and 24-foot width is a one-fourth pitch roof. Roof slope is expressed in the inches of rise, per foot of horizontal run.

**Plan view**- Drawing of a structure with the view from overhead, looking down.

**Plenum**- The main hot-air supply duct leading from a furnace.

**Plumb**- Exactly vertical and perpendicular.

**Plumbing rough-** Work performed by the plumbing contractor after the Rough Heat is installed. This work includes installing all plastic ABS drain and waste lines, copper water lines, bath tubs, shower pans, and gas piping to furnaces and fireplaces. Lead solder should not be used on copper piping.

**Ply-** A term to denote the number of layers of roofing felt, veneer in plywood, or layers in built-up materials, in any finished piece of such material.

**Point load-** A point where a bearing/structural weight is concentrated and transferred to the foundation.

**Post-** A vertical framing member usually designed to carry a beam. Often a 4" x 4", a 6" x 6", or a metal pipe with a flat plate on top and bottom.

**Post-and-beam-** A basic building method that uses just a few hefty posts and beams to support an entire structure. Contrasts with stud framing.

**Punch list-** A list of discrepancies that need to be corrected by the contractor.

**Quarry tile-** A man-made or machine-made clay tile used to finish a floor or wall. Generally 6" X 6" X 1/4" thick .

**Rafter-** Lumber used to support the roof sheeting and roof loads. Generally, 2 X 10's and 2 X 12's are used. The rafters of a flat roof are sometimes called roof joists.

**Rake-** Slope or slanted.

**Rebar, reinforcing bar-**Ribbed steel bars installed in foundation concrete walls, footers, and poured in place concrete structures designed to strengthen concrete. Comes in various thickness' and strength grade.

**Receptacle-** An electrical outlet. A typical household will have many 120 volt receptacles for plugging in lams and appliances and 240 volt receptacles for the range, clothes dryer, air conditioners, etc.

**Rise-** The vertical distance from the eaves line to the ridge. Also, the vertical distance from stair tread to stair tread (and not to exceed 7 ½").

**Riser-** Each of the vertical boards closing the spaces between the treads of stairways.

**Roof jack-** Sleeves that fit around the black plumbing waste vent pipes at, and are nailed to, the roof sheathing.

**Roof joist-** The rafters of a flat roof. Lumber used to support the roof sheathing and roof loads. Generally, 2 X 10's and 2 X 12's are used.

**Roof sheathing or sheeting-** The wood panels or sheet material fastened to the roof rafters or trusses on which the shingle or other roof covering is laid.

**Rough opening-** The horizontal and vertical measurement of a window or door opening before drywall or siding is installed.

**Rough sill-** The framing member at the bottom of a rough opening for a window. It is attached to the cripple studs below the rough opening.

**Roughing-in-** The initial stage of a plumbing, electrical, heating, carpentry, and/or other project, when all components that won't be seen after the second finishing phase are assembled. See also Heat Rough, Plumbing Rough, and Electrical Rough.

**Run, roof -** The horizontal distance from the eaves to a point directly under the ridge. One half the span.

**Run, stair-** the horizontal distance of a stair tread from the nose to the riser.

**R Value-** A measure of insulation. A measure of a materials resistance to the passage of heat. The higher the R value, the more insulating "power" it has. For example, typical new home's walls are usually insulated with 4" of batt insulation with an R value of R-13, and a ceiling insulation of R-30.

**Sand float finish-** Lime that is mixed with sand, resulting in a textured finish on a wall.



**Schedule (window, door, mirror)**- A table on the blueprints that list the sizes, quantities and locations of the windows, doors and mirrors.

**Scrap out**- The removal of all drywall material and debris after the home is "hung out" (installed) with drywall.

**Scratch coat**- The first coat of plaster, which is scratched to form a bond for a second coat.

**Service equipment**- Main control gear at the service entrance, such as circuit breakers, switches, and fuses.

**Settlement**- Shifts in a structure, usually caused by freeze-thaw cycles underground.

**Sheathing, sheeting**- The structural wood panel covering, usually OSB or plywood, used over studs, floor joists or rafters/trusses of a structure.

**Shim**- A small piece of scrap lumber or shingle, usually wedge shaped, which when forced behind a furring strip or framing member forces it into position. Also used when installing doors and placed between the door jamb legs and 2 X 4 door trimmers. Metal shims are wafer 1 1/2" X 2" sheet metal of various thickness' used to fill gaps in wood framing members, especially at bearing point locations.

**Short circuit**- A situation that occurs when hot and neutral wires come in contact with each other. Fuses and circuit breakers protect against fire that could result from a short.

**Slab, concrete**- Concrete pavement, i.e. driveways, garages, and basement floors.

**Slab on grade**- A type of foundation with a concrete floor which is placed directly on the soil. The edge of the slab is usually thicker and acts as the footing for the walls.

**Slope**- The incline angle of a roof surface, given as a ratio of the rise (in inches) to the run (in feet). See also pitch.

**Solid bridging-** A solid member placed between adjacent floor joists near the center of the span to prevent joists or rafters from twisting.

**Span-** The clear distance that a framing member carries a load without support between structural supports. The horizontal distance from eaves to eaves.

**Specifications or Specs-** A narrative list of materials, methods, model numbers, colors, allowances, and other details which supplement the information contained in the blue prints. Written elaboration in specific detail about construction materials and methods. Written to supplement working drawings.

**Square-** A unit of measure-100 square feet-usually applied to roofing and siding material. Also, a situation that exists when two elements are at right angles to each other. Also, a tool for checking this.

**Stair landing-** A platform between flights of stairs or at the termination of a flight of stairs. Often used when stairs change direction. Normally no less than 3 ft. X 3 ft. square.

**Stair rise-** The vertical distance from stair tread to stair tread (and not to exceed 7 ½")

**STC (Sound Transmission Class)-** The measure of sound stopping of ordinary noise.

**Steel inspection-** A municipal and/or engineers inspection of the concrete foundation wall, conducted before concrete is poured into the foundation panels. Done to insure that the rebar (reinforcing bar), rebar nets, void material, beam pocket plates, and basement window bucks are installed and wrapped with rebar and complies with the foundation plan.

**Stick built-** A house built without prefabricated parts. Also called conventional building.

**Stop Order-** A formal, written notification to a contractor to discontinue some or all work on a project for reasons such as safety violations, defective materials or workmanship, or cancellation of the contract.

**Suspended ceiling-** A ceiling system supported by hanging it from the overhead structural framing.

**Take off-** The material necessary to complete a job.

**Taping-** The process of covering drywall joints with paper tape and joint compound.

**Tempered-** Strengthened. Tempered glass will not shatter nor create shards but will "pelletize" like an automobile window. Required in tub and shower enclosures and locations, entry door glass and sidelight glass, and in a window when the window sill is less than 16" to the floor.

**Time and materials contract-** A construction contract which specifies a price for different elements of the work such as cost per hour of labor, overhead, profit, etc. A contract which may not have a maximum price or may state a 'price not to exceed'.

**UL (Underwriters' Laboratories)-** An independent testing agency that checks electrical devices and other components for possible safety hazards.

**Vapor barrier-** A building product installed on exterior walls and ceilings under the drywall and on the warm side of the insulation. It is used to retard the movement of water vapor into walls and prevent condensation within them. Normally, polyethylene plastic sheeting is used

**Visqueen-** A 4 mil or 6 mil plastic sheeting

**Voltage-** A measure of electrical potential. Most homes are wired with 110 and 220 volt lines. The 110 volt power is used for lighting and most of the other circuits. The 220 volt power is usually used for the kitchen range, hot water heater and dryer.

**Walk-Through-** A final inspection of a home before "Closing" to look for and document problems that need to be corrected.

**Water closet-** Another name for toilet.

**Watt-** A measure of the electrical requirement of an appliance calculated by multiplying the voltage times the amperage. For example: a 150 watt light bulb which uses 110 volt power needs a little less than 1 amp (110 volts X 1 amp= 110 watts).

**Weep holes-** Small holes in storm window frames that allow moisture to escape.

**Zoning-** A governmental process and specification which limits the use of a property e.g. single-family use, high rise residential use, industrial use, etc. Zoning laws may limit where you can locate a structure. Also see building codes.

