



## Module 2 - Plans and Drawings

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### Introductory Information

**A set of working plans, along with the written specifications, make up the “language of construction.” Reading and understanding the relationship that one view or drawing has with another is a necessary skill.**

**The series of views in a set of plans are all related to each other by a system known as “orthographic projection.” *Orthographic Projection* is a way of drawing an object from different directions. Usually a front, side, and plan view are drawn so that a person**

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looking at the drawing can see all the important sides. The different views are arranged so that the user can form a mental picture of the structure.

## Learning Objectives

After completing this module, students should be able to:

1. Identify the various views of a drawing that are included in a set of plans and their relationship to each other.
2. Identify and define material symbols, abbreviations, and lines used in drawings.
3. Describe proper handling procedures for plans and drawings.

## Projecting the View

The views of an orthographic drawing are projected at right angles ( $90^\circ$ ) to each other and have a definite relationship. The best way to visualize this is by cutting and unfolding a cardboard box.

The front view has remained in position. The four adjoining views have revolved on their “hinges”  $90^\circ$  with the front view bringing them into the same plane. In other words, the top view is above, the right side is to the right, the bottom view is below and the left side is to the left. The rear view can be shown in various ways.

In architectural drawings, the different views of the building (floor plans and elevations) are obtained in the same manner.

Each view is projected towards its “viewing plane,” then unfolded and brought into plane with the front view.

Due to the size of most architectural structures, the different views usually are separated and placed on individual sheets. These individual sheets form the set of plans for a particular job.

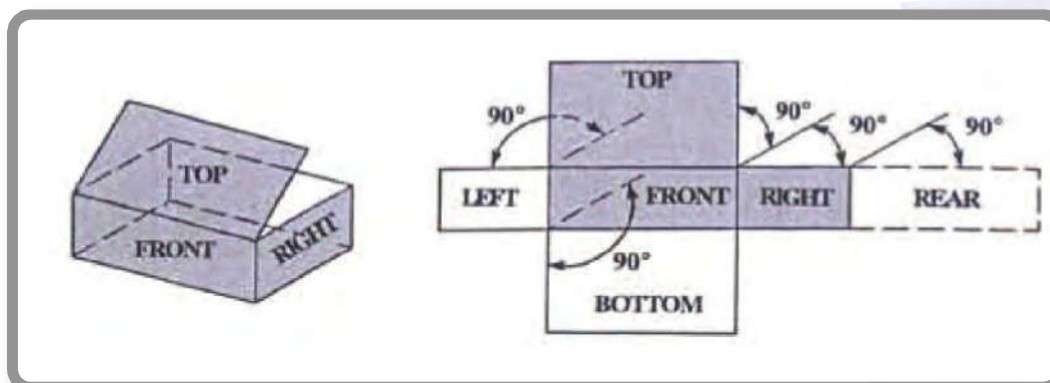


Figure 1: Projection of an Orthographic View

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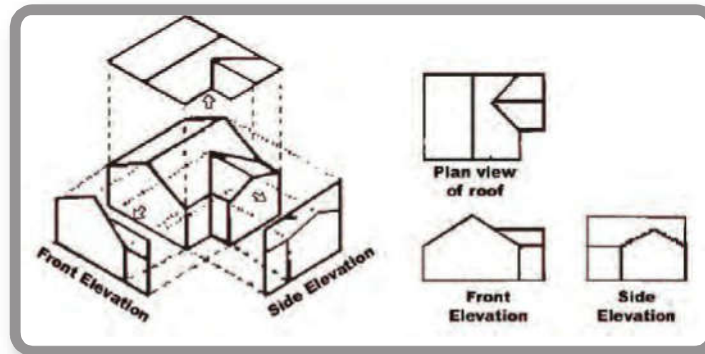


Figure 2: Three-View Concept

### How Plans are Read

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

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

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

### The Language of Plans

Reading and understanding construction blueprints and plans begin with recognizing the various symbols, abbreviations, and lines that appear on drawings. Trade groups and associations try to develop standard symbols and abbreviations for this purpose. However, there are some variations. For example, a draftsman may use different symbols for the same object. New materials may require new or modified symbols or new processes may require new abbreviations. The architect who produces the plans must make sure that they will be understood.

The list of symbols and abbreviations on the first or second sheet of a set is put together by the architectural firm. There is often a list of symbols and abbreviations at the beginning of each separate section. For example the mechanical engineer may have a list with the mechanical drawings. The electrical engineer may have a list with the electrical drawings. The drawings often include a table or legend for the abbreviations and symbols used.

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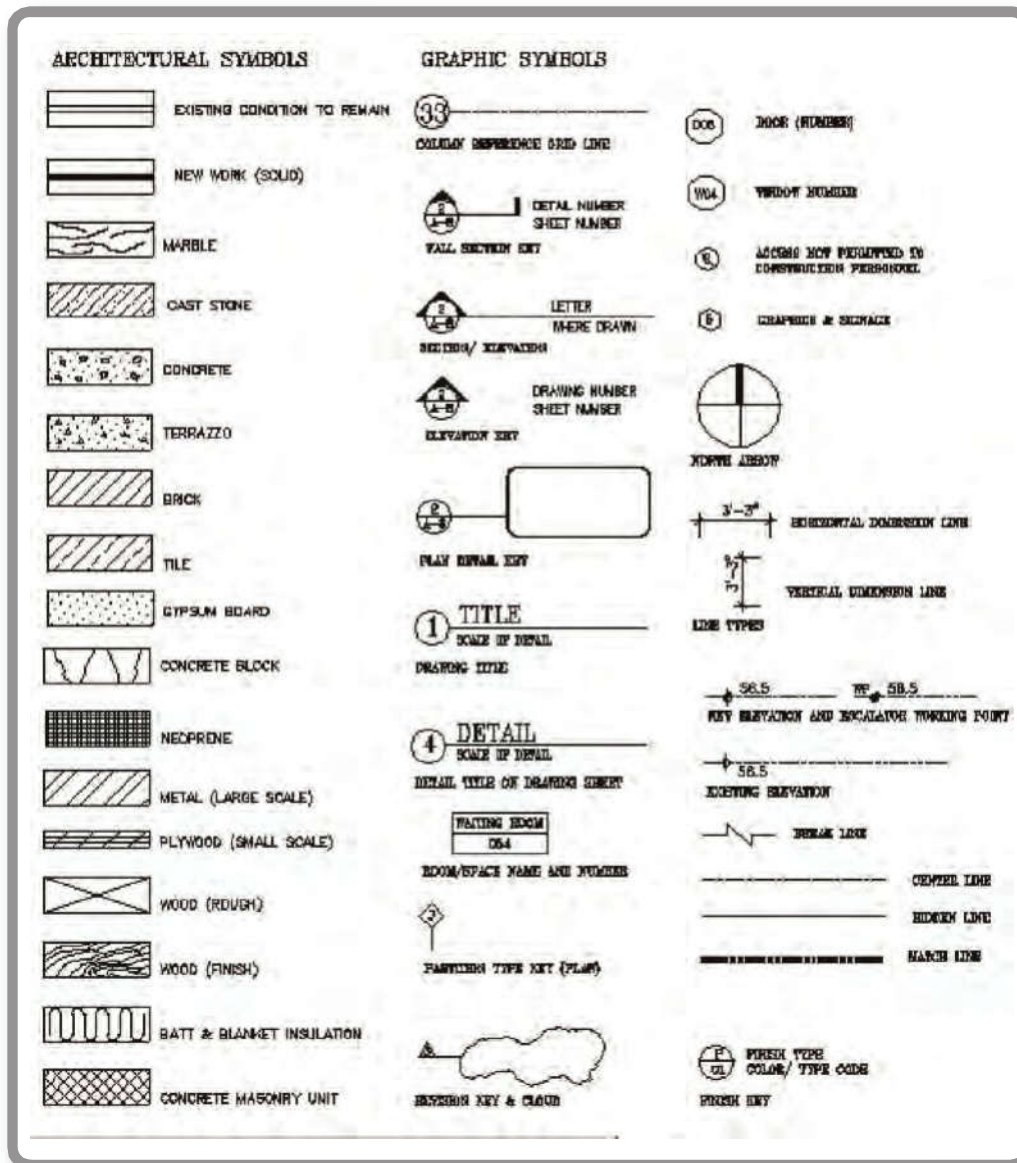


Figure 3: Symbols (Bank Building DWG T02; File A001)

## Symbols

Symbols generally do not resemble the objects they represent; therefore, they must be memorized. Generally, two types of symbols are used on plans and drawings. One type consists of picture-like drawings that can be easily recognized while the other represents materials that may not be

recognizable unless you are familiar with those particular symbols.

Regardless of the trade in which you are employed, you should be familiar with all symbols used on a plan or drawing since they may affect your area of construction.



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### Abbreviations

Using abbreviations saves time and space on drawings. However, there are no set standards for abbreviations, and they vary according to the architect or engineer. Care should be taken in reading abbreviations. They may have two or more meanings. For example, “S” can mean “soil,” “south,” “sewer,” or “switch.” Abbreviations are usually clarified on the table or legend and found on the cover sheet of a set of blueprints. Usually, looking at the item indicated will give a clue as to the meaning of an abbreviation.

&	And	ENGR	Engineer
@	At	ENTR	Entrance
AB	Anchor Bolt (See EB)	EQ	Equal
A/C	Air Conditioning	EQP	Equipment
AC	Acoustical	EWC	Electric Water Cooler (See DF)
ACU	Air Conditioning Unit	EXG	Existing
AD	Access Door (See AP)	EXH	Exhaust
ADJ	Adjacent/Adjoining	EXP	Exposed
AFF	Above Finish Floor	EXPAN	Expanded/Expansion
AGG	Aggregate	EXT	Exterior
AHU	Air Handling Unit		
ALT	Alternate	FA	Fire Alarm
ALUM	Aluminum	FAB	Fabricated
AP	Access Panel (See AD)	FD	Fire Damper
APPRX	Approximate	FE	Fire Extinguisher
ARCH	Architectural	FEC	Fire Extinguisher Cabinet (With Extinguisher)
ASB	Asbestos	F/F	Face to Face (Clear Distance)
ASPH	Asphalt	FIN	Finish
AUTO	Automatic	FIX	Fixture
AVE	Avenue	FL	Floor/Flooring
AVG	Average	FLD	Floor Drain
		FLG	Flange
BD	Board	FND	Foundation
BEV	Beveled	FOM	Face of Masonry
BLDG	Building	FP	Fireproof
BLKG	Blocking	FPM	Feet per Minute
BM	Beam	FPNG	Fireproofing
BOT	Bottom	FPSC	Fire Proof Self Closing (Pressure) Fire Retardant
BRG	Bearing	FRT	Treated
BTW	Between	FS	Floor Sink
		FT	Foot/Feet
CC	Cubic Centimeter	GA	Gage (Gauge)
C/C	Center to Center	GAL	Gallon
CCTV	Closed Circuit Television	GALV	Galvanized
CEM	Cement	GC	General Contractor
CFLSH	Counter Flashing	GCT	Grand Central Terminal
CFM	Cubic Feet Per Minute	GL	Glass
CI	Cast Iron	GPM	Gallons per Minute
CIP	Cast in Place	GRL	Grille
CJ	Control Joint (See EXP JT)	GRTG	Grating
CLG	Ceiling	GT	Guastavino Tile
CL	Closet	GYP	Gypsum
CLR	Clear/Clearance		
CM	Construction Manager	H	High
CMU	Concrete Masonry Unit	HB	Hose Bib
COL	Column	HDW	Hardware
CONC	Concrete	HFT	Historic Fixture Type
CONN	Connection	HFN	Historic Fixture Number
CONST	Construction	HGR	Hangar
CONT	Continuous	HP	High Point
CORR	Corridor	HR	Hour
CS	Caen Stone	HT	Height
CT	Ceramic Tile	HTG	Heating
CW	Cold Water	HVAC	Heating, Ventilation, and Air Conditioning
		HW	Hot Water
DA	Double Acting	HWD	Hardwood
DBL	Double		
DF	Drinking Fountain (See EWC)	ID	Inside Diameter
DIAM	Diameter	IN	Inch(es)
DIM	Dimension	INCL	Including/Included
DL	Dead Load	INSUL	Insulate/Insulated/Insulation
DN	Down	INT	Interior
DTL	Detail	INV	Inverted
DWG	Drawing		
		KIT	Kitchen
E	East		
EA	Each		
EB	Expansion Bolt (See AB)		
EJ	Expansion Joint (See CJ)		
ELEC	Electrical/Electric		

Figure 4: Abbreviations (Sheet 1)

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LAM	Laminated	RO	Rough Opening
LAV	Lavatory	RR	Railroad
LB(S)	Pounds	RTN	Return
LL	Live Load	S	South
LT	Light	SCHED	Schedule
LTG	Lighting	SCT	Structural Clay Tile
LWC	Lightweight Concrete	SEC	Section
MACH	Machine	SFT	Standard Fixture Type
MAS	Masonry	SFN	Standard Fixture
MAT	Material	Number	
MAX	Maximum	SHT	Sheet
MECH	Mechanical	SIM	Similar
MED	Medium	SPEC	Specification
MEMB	Membrane	SQ	Square
MTL	Metal	SS	Stainless Steel
MEZZ	Mezzanine	ST	Street
MFR	Manufacture(r)	STAG	Staggered/Stagger
MH	Manhole	STC	Sound Transmission
MIN	Minimum	Class	
MISC	Miscellaneous	STD	Standard
MNCR	Metro-North Commuter Railroad	STL	Steel
MO	Masonry Opening	STL DR	Steel Door
MTD	Mounted	STL FR	Steel Frame
MTG	Mounting	STOR	Storage
N	North	STR	Structural
NIC	Not in Contract	STS	Self-Tapping Screw
NOM	Nominal	SUSP	Suspend/Suspended
NRC	Noise Reduction Coefficient	SYM	Symmetrical
NTS	Not to Scale	SYS	System
NO	Number	T	Tread
OA	Overall	TC	Terra Cotta
OC	On Center(s)	T/CONC	Top of Concrete
OD	Outside Diameter	T/STL	Top of Steel
O/O	Out to Out	T/WALL	Top of Wall
OPG	Opening	T&B	Top and Bottom
OPH	Opposite Hand	T&G	Tongue and Groove
OPP	Opposite	TEL	Telephone
ORN	Ornamental	TEMP	
OZ	Ounce	TEMP GL	Tempered Glass
PA	Public Address	TF	Temporary Fixture
PB	Pull Box	THK	Thick/Thickness
PCF	Pounds per Cubic Foot	TV	Television
PCS	Precast	TYP	Typical
PFAB	Prefabricated	TZ	Terrazzo
PL	Plate	U	Urinal
PLAS	Plaster	UC	Undercut
POL	Polish(ed)	UNFIN	Unfinished
PPT	Pressure Preservative Treated	UNGD	Underground
PR	Pair	UL	Underwriters Laboratories
PSF	Pounds per Square Foot	V	Volt
PSI	Pounds per Square Inch	V JT	Vee Joint
PT	Point	VB	Valve Box
PTD	Painted	VCB	Vinyl Cove Base
PTN	Partition	VCT	Vinyl Composition Tile
PVC	Polyvinyl Chloride	VERT	Vertical
PVMT	Pavement	VEST	Vestibule
PWD	Plywood	VOL	Volume
QT	Quarry Tile	VWB	
QTY	Quantity	VWC	Vinyl Wall Covering
R	Rise	W	West
RAD	Radius	W/	With
REBAR	Reinforcing Bar	W/O	Without
REF	Reference/Refer To	WC	Water Closet
REINF	Reinforce/Reinforcing	WD	Wood

Figure 5: Abbreviations (Sheet 2)

## Module 2 - Plans and Drawings

### Lines

The line is the basis of all industrial drawings. By combining lines of different thicknesses, types, and lengths, it is possible to describe graphically any object in sufficient detail so that persons with a basic understanding of blueprint reading can accurately visualize the shape of the part. Various types of lines also serve as symbols. The meaning of each line is determined by how it is drawn.

Lines used in drawings have a standard, accepted meaning. When properly drawn, each of the following lines helps convey meaning to a drawing or plan.

### Property Line

A property line is an extra heavy line made up of two short dashes alternating with long dashes. The property line is shown on a site plan (a plan that shows the whole piece of property under construction).

### Object Line

An object line is a heavy continuous line that shows the outline of a structure or an object. The outline of objects such as rooms, doors, and windows are made with the object line.

### Hidden Lines

Hidden lines are made up of medium weight, evenly spaced, short dashes. They are used to show objects, edges, or surfaces that are not visible in a particular view. Often these hidden parts will be revealed in an elevation or in a sectional view as shown in Figure 9. Hidden lines are used to help clarify a drawing.

### Break Lines

Break lines are used to show that an object has not been drawn in its entirety. This is sometimes necessary to save space. A long break is shown by means of a zigzag in the line. A short break is shown with regular lines separating the two parts of an object.

### Dimensions and Extension Lines

Dimension lines are thin lines used to indicate the distance between two points. Extension lines extend out from the object to show what points are being measured. Dimension lines end with an arrowhead, a dot, a slash, or some other mark where they meet the extension lines. Measurements are written on or above the dimension line.

### Center Lines

Center lines indicate the center of symmetrical objects such as doors, windows, or columns. A center line is made up of alternating long and short dashes.

### Leader or Reference Lines

Leader or reference lines are used to connect a note or label to an object. A leader line may be straight, angled, or curved and usually ends in an arrowhead. A leader line may also indicate that an imaginary cut has been made at this point and that a detail is shown elsewhere on the drawings. Letters and numerals, usually in a circle attached to line, will generally indicate where this information can be found.

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## Drawings

The floor plan is perhaps the most important drawing since it provides the largest amount of information. The floor plan, combined with elevation drawings, will give a clear image of what the structure should look like when it is constructed.

The floor plan is a view from above representing a horizontal section at about eye level on each floor. In other words, imagine making a horizontal cut about four feet up

from the floor through the entire structure. When the top is lifted away, the walls, doors, windows, etc. will be exposed. This view reveals the layout of the structure or building. The floor plan shows exterior and interior walls, doors, windows, stairways, fireplaces, mechanical equipment, etc. as in Figure 6.

The first floor plan is generally the key drawing and is used as a guide for other drawings. Drawings for multi-story buildings include a floor plan for each floor including the basement.

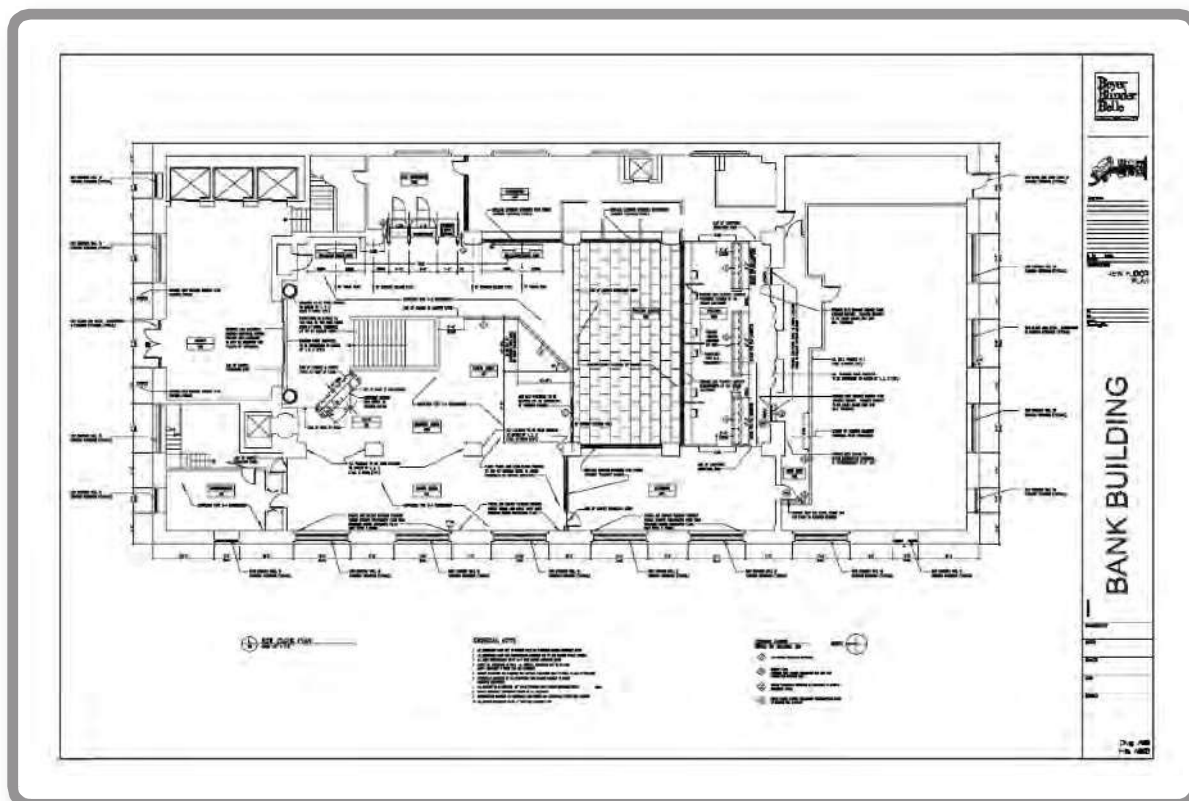


Figure 6: Bank Building (DWG A02; File A003)



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Elevation drawings show the exterior view of a building as seen by a person looking at each side. Elevation drawings show features such as the style of the building, doors, windows, moldings, etc. as in Figure 7. Any feature on an elevation drawing that does not have sufficient clarity will be shown on a larger scale in a detail drawing.

interior wall or area. Elevations are labeled using directions such as east, west, north, and south.

Symbols are commonly used on elevation drawings to indicate the type of finish or material.

Interior elevation drawings may be provided to show the type and construction of a particular

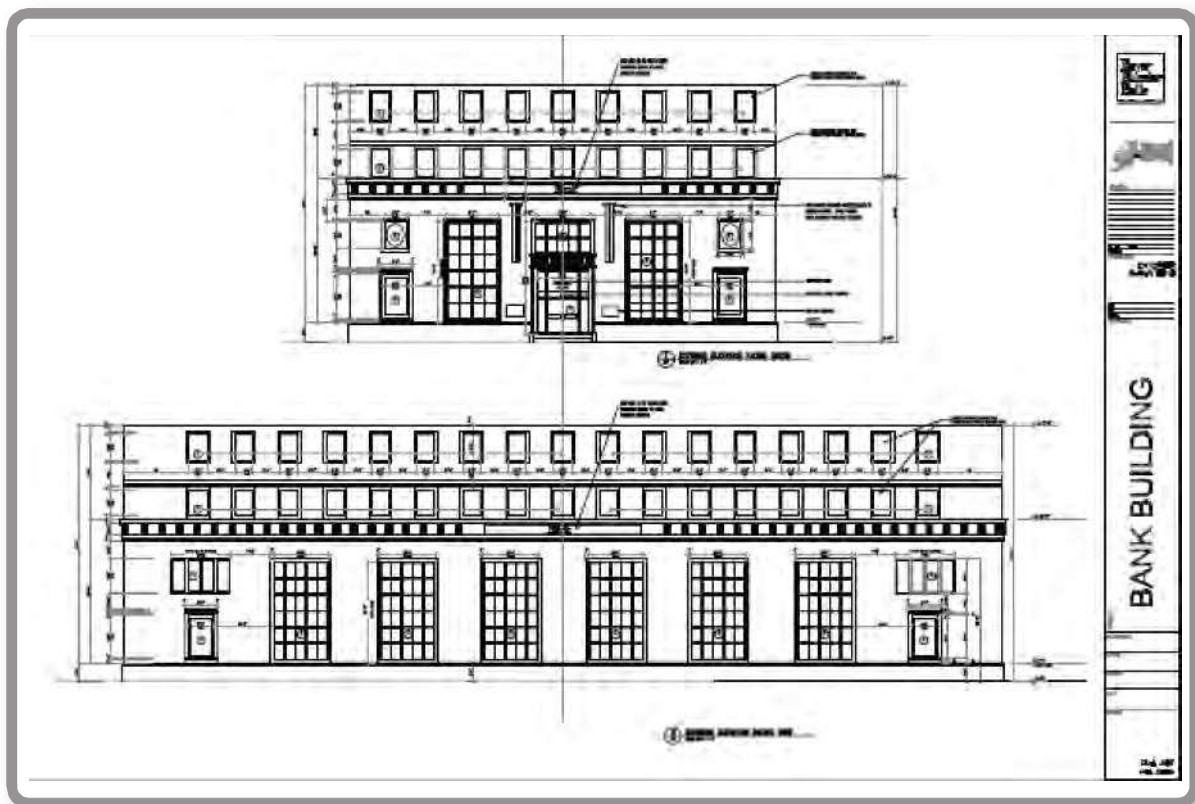


Figure 7: Bank Building (DWG A07; File A004)

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Cross-sectional drawings are made by imagining that a “cut” has been made through an object at right angles. This view allows a look at the “inside” of a wall, window, door, or any other structure to clarify construction procedures as illustrated in Figure 8.

the plan or elevation views. Cross-section views are generally either a longitudinal section (the “cut” passes through the long dimension of a building) or a transverse section (the “cut” passes through the short dimension of a building).

A cross-section drawing can be used in any instance where construction is not shown on

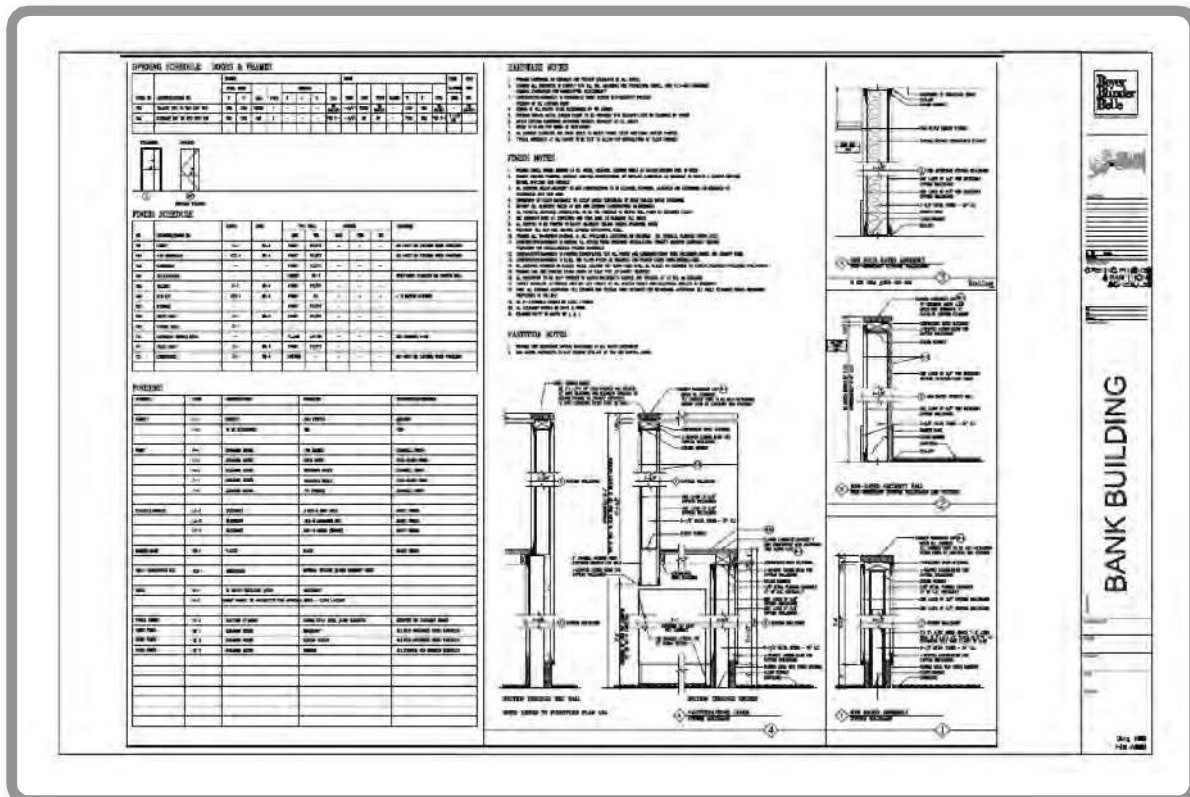


Figure 8: Bank Building (DWG A08; File A007)

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Certain features may not show up clearly on a plan, elevation or sectional view. These special features will require a larger scaled illustration to provide the information needed

for construction. Detailed views are commonly used for walls, hardware, metal members, or any other special feature as in Figure 9.

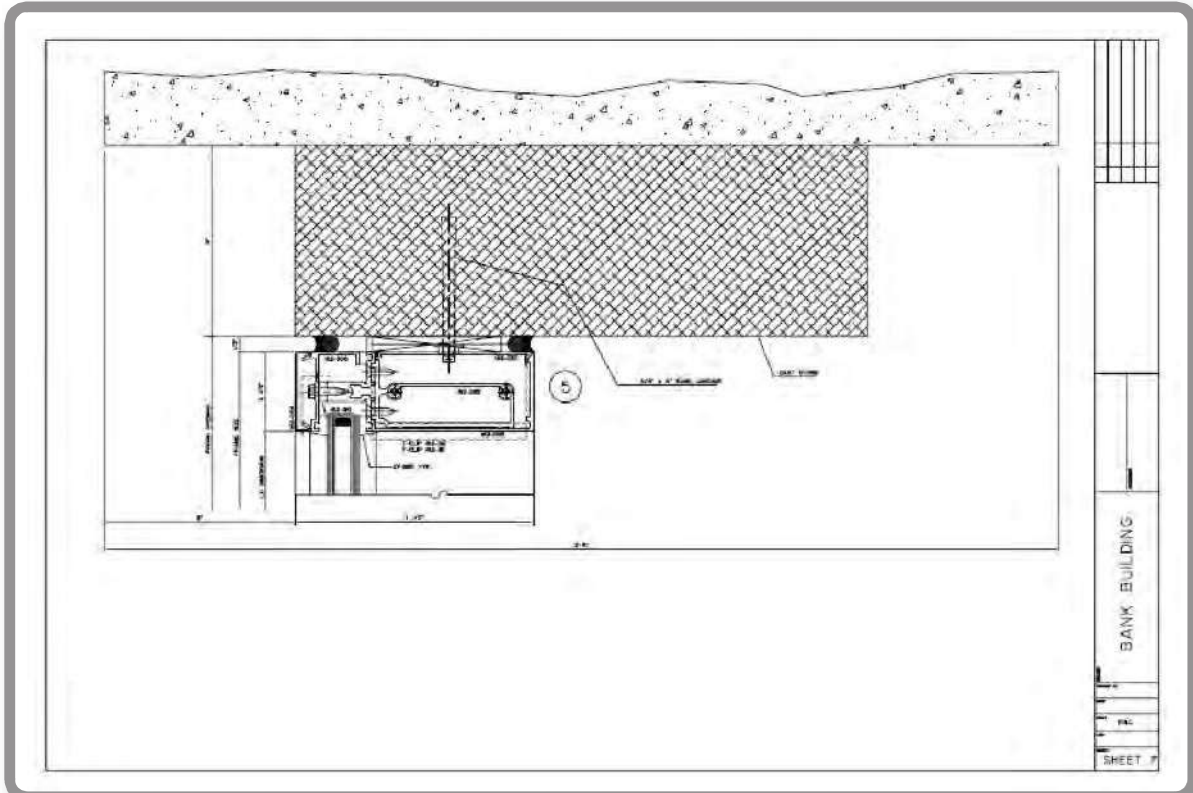


Figure 9: Bank Building (Shop Drawing Sheet 7)

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## Module 2 - Plans and Drawings

### Classroom Exercise

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. What two abilities are needed when reading a set of plans?
  - A. Detail
  - B. Symbol
  - C. Representative
  - D. Cross section
2. To what does the term "interpretation" refer when reading plans?
  - A. True
  - B. False
3. Symbols generally resemble the object or material they represent?
  - A. True
  - B. False
4. What system shows a series of different views arranged so a user can form a mental picture of the structure?
  - A. Floor plans
  - B. Elevations
  - C. Orthographic projection
  - D. Schedules
5. What is the ability to see the size and shape of a structure from a set of plans?
  - A. Interpretation
  - B. Construction language
  - C. Dimensional
  - D. Visualization
6. What is a simplified drawing that represents various objects or materials called?
  - A. Detail
  - B. Symbol
  - C. Representative
  - D. Cross section
7. Door and window schedules are drawings.
  - A. True
  - B. False
8. Which plan or drawing reveals the layout of exterior and interior walls?
  - A. Elevation drawing
  - B. Cross section drawing
  - C. Detail drawing
  - D. Floor plan
9. What drawing allows a look at the inside of a wall?
  - A. Cross section
  - B. Elevation
  - C. Floor plan
  - D. Orthographic

**Module 2 - Plans and Drawings****Homework Exercise**

Name: \_\_\_\_\_ Date: \_\_\_\_\_

- 1.** Draw freehand the following “lines” used on construction plans.
  - A. Property Line
  - B. Object Line
  - C. Hidden Line
  - D. Break line
  - E. Dimension lines and extension lines
  - F. Center line
  - G. Leader line
- 2.** What is the purpose of a “break line?”
  - A. True      B. False
- 3.** Extension lines are used to indicate the distance between two points.
  - A. True      B. False
- 4.** Which line shows the outline of a structure or object?
  - A. Property line
  - B. Break line
  - C. Object line
  - D. Extension line
- 5.** Which line shows objects, edges, or surfaces that are not visible in a particular view?
  - A. Hidden line
  - B. Revealing line
  - C. Object line
  - D. Break line
- 6.** Which line is used to connect a note or label to an object?
  - A. Extension line
  - B. Abbreviation line
  - C. Center line
  - D. Leader or reference line
- 7.** You should store plans in a clean, dry place.
  - A. True      B. False