

BC CARPENTER APPRENTICESHIP PROGRAM

LEVEL 1



COMPETENCY B-1:
Use Construction Drawings and
Specifications

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COMPETENCY B-1

Use Construction Drawings and Specifications

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COMPETENCY B-1

Use Construction Drawings and Specifications

Carpenters must be able to read drawings in order to carry out important responsibilities such as laying out work, ordering materials, and completing projects to predefined requirements. The more proficient carpenters are at interpreting the requirements conveyed by drawings, the more they will be valued by industry. Carpenters are also occasionally required to draw plans.

Objectives

When you have completed the Learning Tasks in this Competency, you will be able to:

- describe the drawings carpenters use for residential construction
- describe the views used in drawings
- describe the type of information found on elevations, floor plans, and other drawings
- identify and describe the symbols, lines, notations, and scales that appear in drawings
- describe the main parts of architectural drawings and the special features found in them
- draw simple plans

Competencies

Written: “Describe Construction Drawings”

You will be tested on your knowledge of the residential drawings carpenters use and the various kinds of information found on them.

Practical: You will be required to apply scales, use scale rules, and extract specific information from prepared residential drawings.

You will be required to draw pictorial and orthographic views.

LEARNING TASK 1

NOTES

Describe the Different Types and Uses of Drawings

To complete a project, a builder requires accurate information about it. This applies whether the project is as simple as a box or as complicated as a high-rise office tower.

Information for completing a project is provided by drawings and specifications. Drawings provide building dimensions, materials, and details of construction. Specifications give more detail on construction procedures and standards required for building materials and quality of construction. Simpler buildings, such as houses, may contain the specifications and all other pertinent information on the drawings in the form of notes. The drawings are known as “working drawings.” Working drawings are sometimes referred to as “blueprints”, a term that’s a carryover from the past when all prints had a blue background with white lines and type.

Conceptual drawings are simplified drawings. They’re used for designing the basic areas and shapes. Conceptual drawings lack many dimensions, details, and structural information. Drawings found in many house plan magazines are conceptual drawings. Once the conceptual drawings have been accepted by the owner, they’re used to create working drawings for the builder.

Types of Views

Views can be either pictorial (three-dimensional) or orthographic (two-dimensional). They can be from directly overhead looking down (plan view), or from the side looking level (elevations). Drawings can be from other perspectives, including a sectional view sliced through an object (cutting plane).

Pictorial View (3-Dimensional)

To provide information about a building or house to be built, an architect can make several types of views to show how the building will look when completed. These three-dimensional views are called “pictorial drawings.” They provide a picture of the building and are produced in three different ways:

- perspective
- isometric
- oblique

NOTES

Perspective View

A perspective view presents a building just as it would look to you when finished. It gives a more realistic view than the isometric and oblique views. A simple perspective view uses a single vanishing point. Parallel lines for one axis are drawn as if to a point.

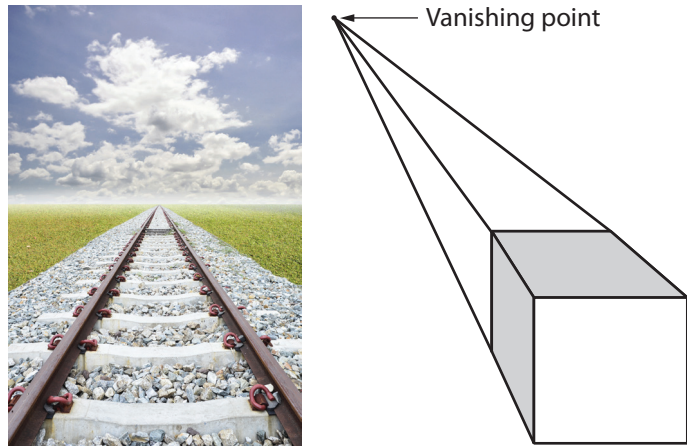


Figure 1 – Vanishing point in a photo (left) and in a drawing (right)

Isometric View

An isometric view is a three-dimensional view, with the plumb lines being vertical and the horizontal lines set at 30° angles from a line parallel to the bottom of the page. Isometric views have no vanishing point, so the objects do not appear as they would in a perspective view.

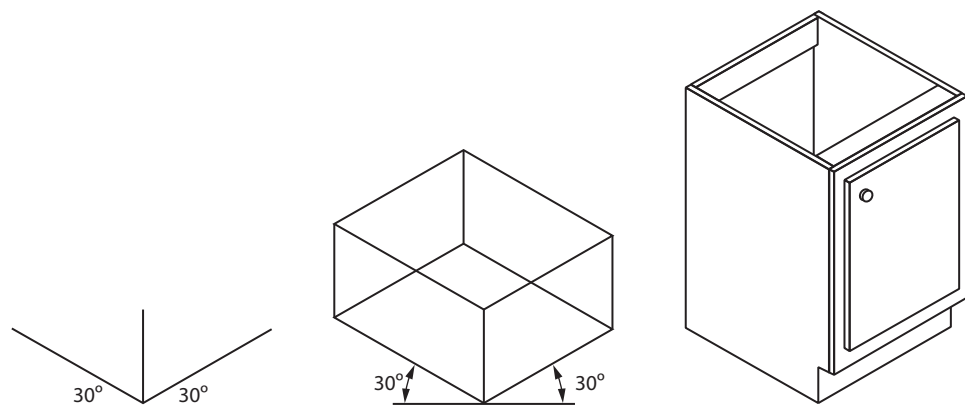


Figure 2 – Isometric views with plumb lines vertical and horizontal lines at 30° angles

Oblique View

An oblique view is similar to an isometric view, except that the face or front view is drawn to exact scale and the oblique lines are extended at a 30–45° angle to form a three-dimensional object. These are the easiest 3-D drawings to create. They're similar to a perspective drawing, but without a vanishing point.

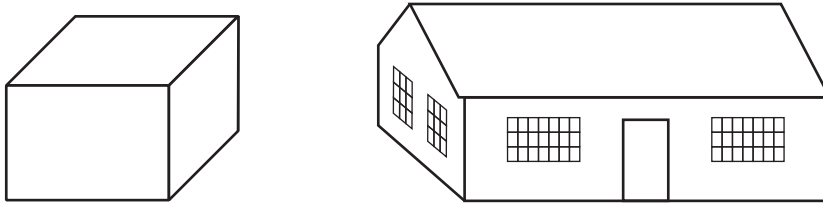


Figure 3 – Oblique views of a box and house

Orthographic View (2-Dimensional)

The most common view for working drawings is the “orthographic projection,” which is used almost universally in all fields of architecture and engineering. The orthographic projection is a view that shows only one face of an object, such as the front, side, top, or back (Figure 4).

Carpenters usually work from drawings. Site plans, foundation plans, floor plans, elevations, and sections are normally drawn using orthographic views.

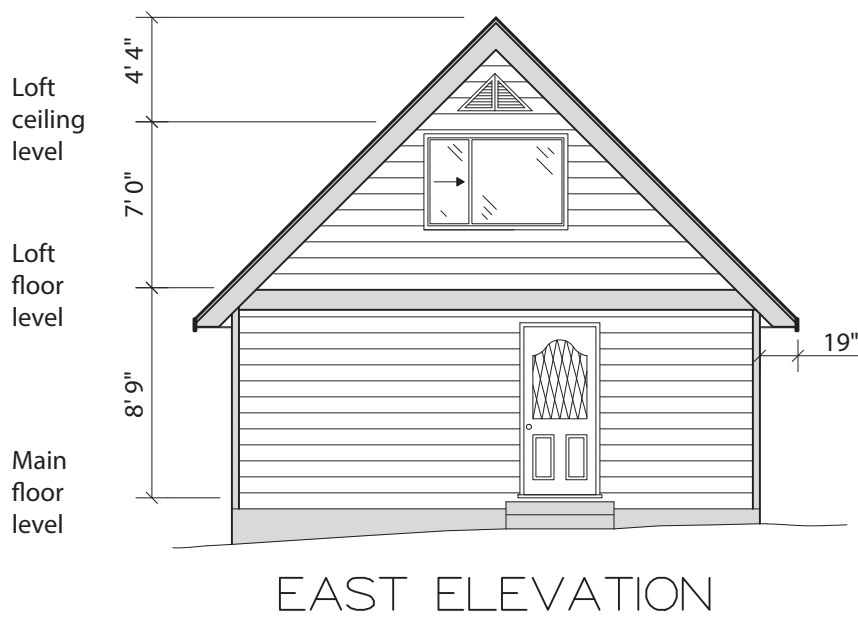


Figure 4 – Orthographic view

Types of Drawings

On very large projects such as high-rise office towers, it's impossible to place all the pertinent information on one drawing. There's too much information and it'll be difficult to understand. For this reason, several types of drawings are made, divided into several classifications, each with specific information.

NOTES

NOTES

The following is a list of the different types of drawings:

- architectural
- structural
- mechanical
- electrical
- shop
- as-built
- landscape
- schedules
- specifications

If the building is fairly simple (as is the case with most houses), all the information can be combined on one set of drawings, from which all the trades will work.

Architectural Drawing

The architectural drawing is the main drawing of a building. It presents the overall design of the building or object to be built. It details all the finishing and the materials used. The drawings include floor plans, elevations, sections, and details.

Architectural drawings are usually indicated with an “A,” followed by the drawing page number. For example, “A-4” is the fourth page of the architectural set of drawings.

Structural Drawing

A structural drawing is usually required for larger and/or engineered buildings. It can be a simple one-page drawing or very complicated with many pages of drawings.

The structural drawing gives information about the size of beams and girders, the reinforcing steel design, and the size and shape of structural members. It also details the materials to be used and the desired strengths of concrete. This drawing is usually prepared by the structural engineer, who’s hired by the architect to design all the structural components of the building.

Structural drawings are usually indicated with an “S,” followed by the drawing page number.

Mechanical Drawing

The mechanical drawing is used to identify and locate services for the mechanical trades: heating, plumbing, ventilation, and air conditioning, along with associated duct work.

The mechanical drawing uses the floor plans of the architectural drawings, with most of the details removed, so that they won't interfere with the mechanical details. Sometimes other drawings are required to complete the mechanical drawing. If there is a great deal of mechanical information, the drawing may be split into two drawings, with plumbing details on one and the rest on the other.

Mechanical drawings are usually indicated with an "M," followed by the drawing page number.

Electrical Drawing

The electrical drawing is used to identify and locate services for the electrical part of the building. It shows the layout of wiring for lights, switches, outlets, and panels. It also shows services for low-voltage systems such as telephone, cable television, and inter-communication network. On large commercial buildings, factories, and high-rise office towers, the electrical services can be complicated.

The electrical drawing is designed by an electrical engineer. It's usually indicated with an "E," followed by the drawing page number.

Shop Drawing

The manufacturers of certain building components are required to make shop drawings for those components. Cabinet manufacturers, structural steel contractors, and window manufacturers all use shop drawings to detail how their components are built and installed. The architect or project manager approves the shop drawings before the manufacturer begins construction of the components.

Copies of the approved shop drawings are sent to the construction site where they're used to verify the final dimensions and details. For example, the cabinet shop drawings are used to position the partitions around the cabinets. The partitions are completely finished before the cabinets are delivered to the job, so they have to be placed exactly.



Approved shop drawings take precedence over construction drawings.

NOTES

Specialty items are often accompanied by shop drawings. Specialty items include (but are not limited to): vaults, fixtures, rolling window shutters, hoists, and loading dock levelers. These special items need specific allowances in the construction of the building, and the approved shop drawings must be followed carefully.

As-built Drawing

As part of the contract to complete a larger building, the building contractor is normally required to provide the owner with a set of “as-built” drawings. The purpose of these drawings is to show where the electrical and mechanical systems were installed as well as any changes that were made during construction. Changes should be identified with revision clouds (Figure 5). As-built drawings are often used for maintenance work and future renovations and retrofits.

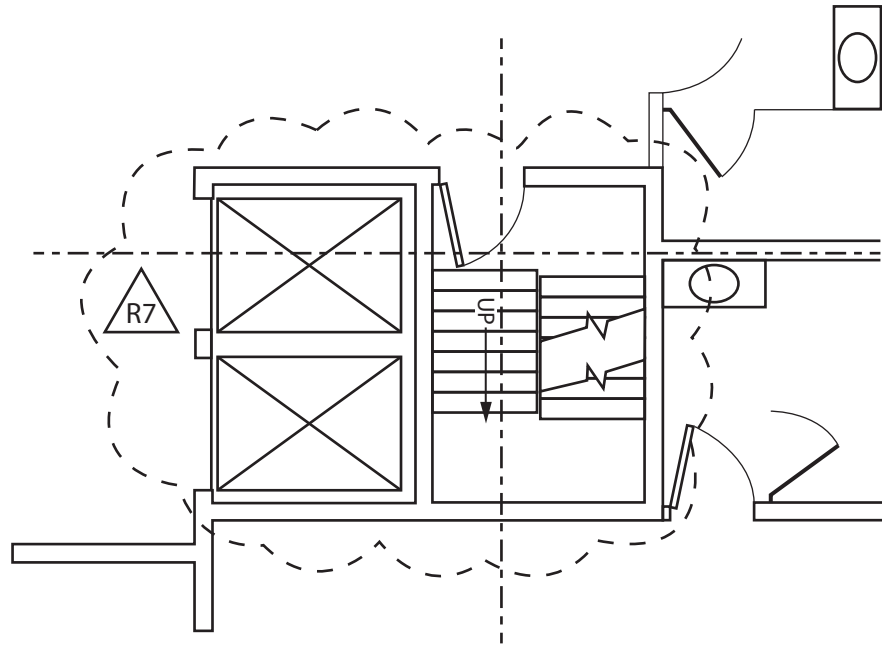


Figure 5 – Revision cloud

Landscape Drawing

A landscape drawing may or may not be part of a building contract. A landscape architect designs the landscape and shows all the recommended trees, shrubs, flowers, grass, and structures such as fences, seating, and walkways. The landscape drawing can be a very important part of the final appearance of a building. A well-designed landscape can enhance a building or house, whereas a good building design can be ruined with poor landscape design.

An erosion control plan may be required as part of the landscape design. Its role is to ensure effective containment of sediment to specific areas. It will minimize erosion and prevent sediment from moving into bordering areas such as streets, wetlands, or a neighbour's property. It also provides for temporary measures such as the design of a tracking pad to ensure a stable entrance to and from the construction site.



Modifications must occasionally be made to the top of wall foundation heights to accommodate the landscape design.

Schedules

Although mostly text, schedules are part of the drawings. Schedules are used to provide information about building components. It's more efficient to lay out the specifications for each door or window once in the schedule rather than multiple times on the drawings.

For example, a schedule is often used in commercial construction where there can be 50 components which are all the same size and specification. A symbol is used on the drawings to indicate the component and to refer back to the schedule for its detailed description.

Schedules are commonly used in plans for larger buildings. They're used for doors, windows, room finishes, foundations, ceiling types, etc.

Door Schedule

Door schedules provide door sizes, materials, style, hardware requirements, and other special notes. Each door is indicated by a symbol on the floor plan, usually a letter in a circle or square; the corresponding letter is used in the door schedule. Figure 6 shows a typical door schedule.

DOOR						FRAME		THRESHOLD	WEATHER STR	REMARKS
Type	Size (width × height × thickness)	Mat.	Core	Fin.	Closer	Material	Fin			
A	750 × 2100 × 45	Alum	Hollow	Anod	Yes	Alum	Anod	Yes	Yes	Double glazed
B	810 × 2100 × 45	DO	DO	Pt.	No	Steel	Pt	Yes	No	Lock and key
C	910 × 2030 × 45	Wood	DO	DO	DO	DO	DO	No	DO	-
D	610 × 2030 × 45	DO	Solid	DO	DO	DO	DO	Yes	DO	-
E	750 × 2100 × 35	DO	Hollow	DO	DO	Wood	DO	No	DO	-
F	810 × 2100 × 35	DO	DO	DO	DO	DO	DO	DO	DO	-
G	910 × 2030 × 35	DO	DO	DO	Yes	DO	DO	DO	DO	-

Figure 6 – Door schedule (note: in this schedule "DO" means "ditto")

NOTES

Specifications

A list of specifications is often included as part of the drawings. The specifications for large projects can be the size of a book. They're a detailed description of work to be done and the methods by which this work must be performed. The text of the specifications allows the designer to be very specific about the construction process and the products used.



Specifications take precedence over construction drawings and schedules.



Now complete Self Test 1 and check your answers

Self Test 1

1. What is a plan view?

2. Which 3-D drawing view is the most realistic looking?

- a. perspective
- b. isometric
- c. oblique
- d. orthographic

3. Which 3-D drawing type is the easiest to draw?

- a. perspective
- b. isometric
- c. oblique
- d. orthographic

4. Which of the following drawing views is two-dimensional?

- a. perspective
- b. isometric
- c. oblique
- d. orthographic

5. Architectural drawings are used to show:

- a. landscaping details
- b. structural details
- c. overall design and finishing details
- d. shop details

6. Structural drawings show:

- a. electrical details
- b. beam and girder details
- c. plumbing details
- d. mechanical details

7. Are telephone locations shown on the electrical drawings?

8. What is the purpose of as-built drawings?

9. Are landscape drawings always part of a building contract?

10. Why are schedules used?

LEARNING TASK 2

NOTES

Describe the Alphabet of Lines, Symbols, and Abbreviations Used in Drawings

Working drawings are normally drawn in a small scale (1:50 or 1:100) and this leaves little room for notes about each detail. To save space, architects use symbols and abbreviations to represent building materials such as stucco, wood siding, shingles, doors, windows, and electrical and plumbing items.

Clarity is important, and if notes or dimensions are close together, reading the drawings can be confusing and errors may be made. Most of these errors can be prevented by using symbols, abbreviations, different line types, and standards for drafting.

An “alphabet” of lines also helps you read drawings. If all the lines looked the same, it would be difficult to separate the main object lines from the dimension lines. The hidden lines would show as solid lines, and you could not tell the cutting plane lines from the other lines.

Typically, once drawings are complete, they go to a large format print shop for copying. Most building plans are now done using computer assisted design and drafting (CADD). There are many CADD programs available, with some being specialized for drafting building projects. Once CADD drawings are complete, they’re printed to a PDF file and emailed to the print shop to produce copies.

Many professional draftspersons will purchase their own large format printer or plotter so that they can run off sample drawings in-house.

By standardizing line types, symbols, hatchings, and abbreviations, plans can be drawn that are less cluttered and easier to read.

Alphabet of Lines

Drafting standards have been developed to create an alphabet of lines. The alphabet uses different line darkness and line types (solid, dotted, dashed, etc.) to define a line style. Each different line darkness (weight) requires a certain pencil lead hardness. Information for pencil lead hardness is covered in Learning Task 5 of this Competency. CADD programs let the user choose the line width and type from a menu.

NOTES

The lines used in drawings are:

- border line / title block
- object
- dimension
- construction
- hidden
- centre
- beam
- leader
- break
- section
- joist

Border Line / Title Block

The border line around the page and title block is a dark solid line. Usually a soft pencil (such as an H, F, or HB) will be used.

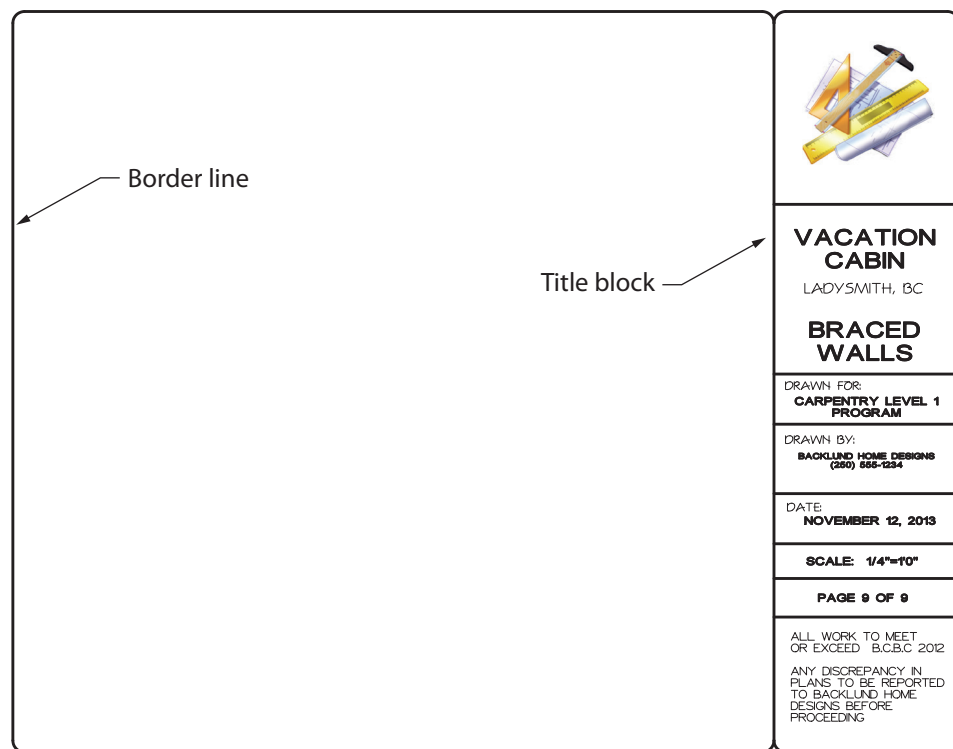


Figure 1 – Border and title block lines

Object Lines

Object lines define the edges of objects such as a wall or foundation. They're solid but darker than most other lines in order to stand out. 2H pencils work well for drawing object lines.

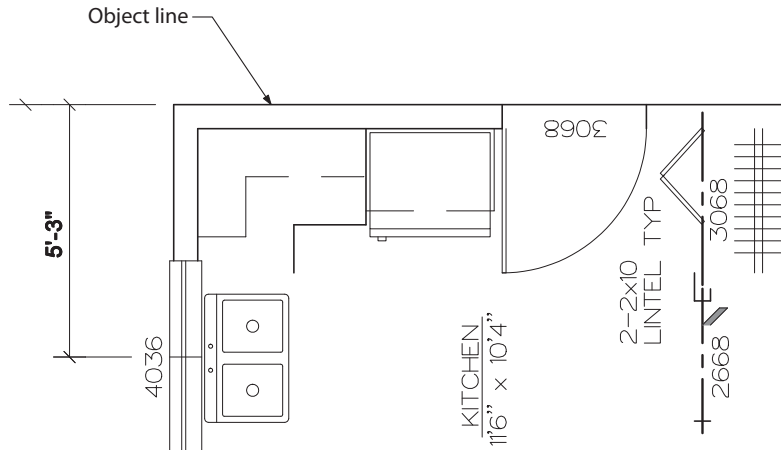


Figure 2 – Object lines

Dimension Lines

Dimension lines are used to show dimensions of walls and other objects, and to show locations and heights. They have several parts including the extensions, end points, the dimension line, and dimension text (measurements). These lines are all solid and lighter weight than object lines. 4H pencils are used for dimension lines.

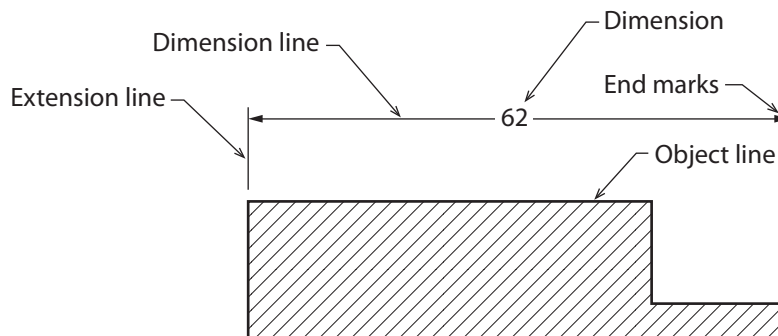


Figure 3 – Dimension lines

NOTES

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Construction Lines

Construction lines are sometimes used by draftspersons to position drawings and to transfer edges of objects from one perspective to another. These are very light solid lines and don't show up in copies. They're usually made with a 5H or 6H pencil.

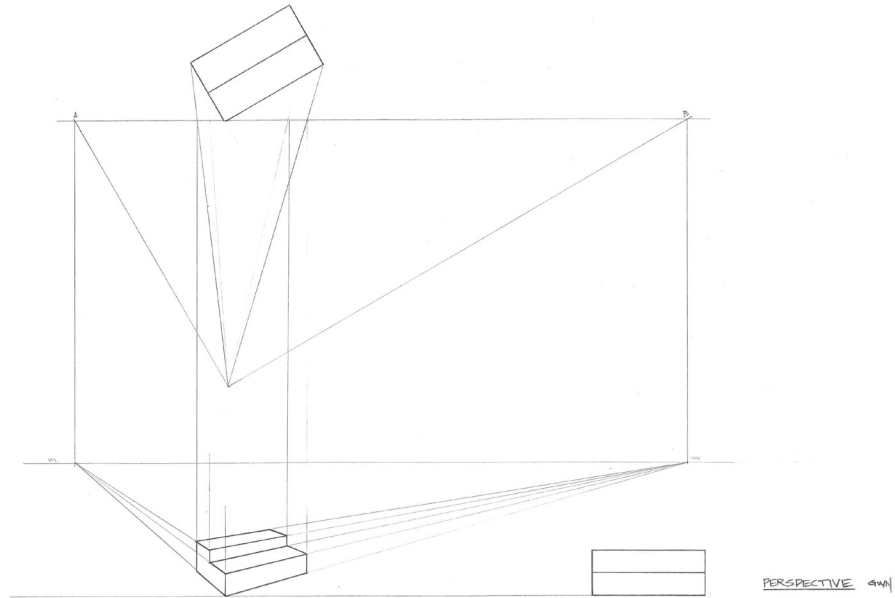


Figure 4 – Construction lines

Hidden Lines

Hidden lines are usually made of short or medium-length dashes. The lines are used to show the location of objects that are hidden by other objects. They're the same weight as the dimension lines and are drawn using a 4H pencil. Hidden lines are often used to show footings on a foundation plan or upper cabinets on a floor plan.

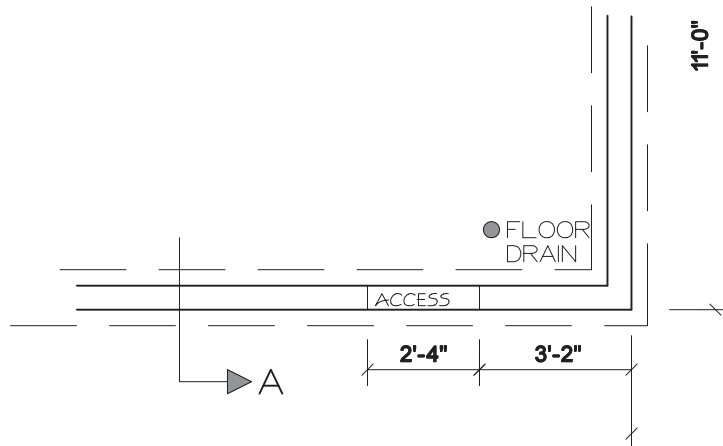


Figure 5 – Hidden lines

Centre Lines

Centre lines indicate the centre of an object, and are often used to provide location measurements for plumbing fixtures and other items. The line type is made up of alternating long and short dashes, and sometimes includes the letters “CL”. They’re the same darkness as dimension and hidden lines.

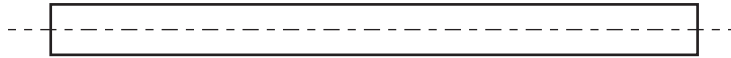


Figure 6 – Centre line

Beam Lines

Beam lines look like centre lines except they’re as dark as an object line. A single line alternating long and short dashes is used to represent the centre of a beam location.

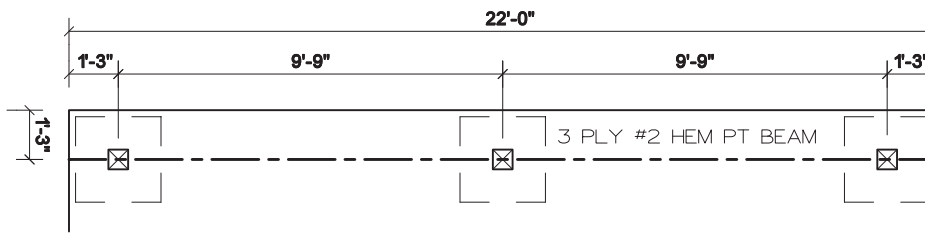


Figure 7 – Beam line

Leader Lines

Leader lines are used with a text description to point to an object. They have the same weight and type as dimension lines.

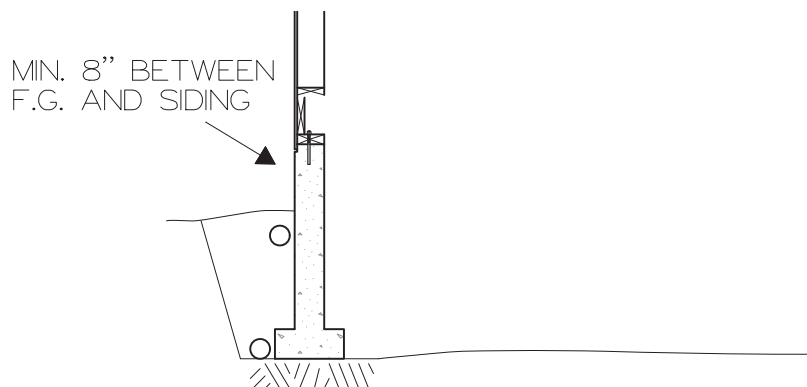


Figure 8 – Leader line

NOTES

Break Lines

Break lines are short solid lines used to cut off part of an object or drawing. They commonly run roughly 45 degrees to the drawing and have a small zigzag about midway.

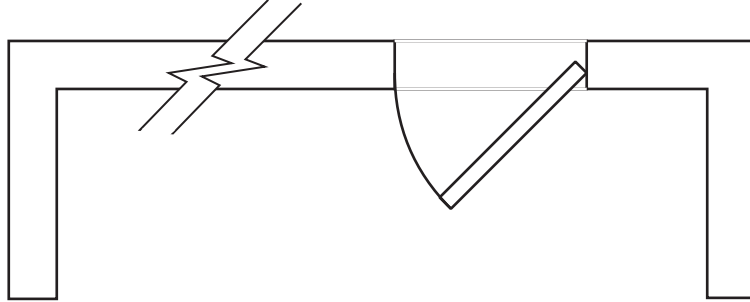


Figure 9 – Break line

Section Lines

Section lines are used to show cutting planes to indicate section and cross section locations. They are the same weight as dimension lines and are drawn using a long dash followed by two short dashes.



Figure 10 – Section (cutting plane) line

Joist Lines

Joist lines with small flags at the end are used to represent floor joists, roof joists, rafters, and trusses. They are solid lines, the same darkness or weight as dimension lines.

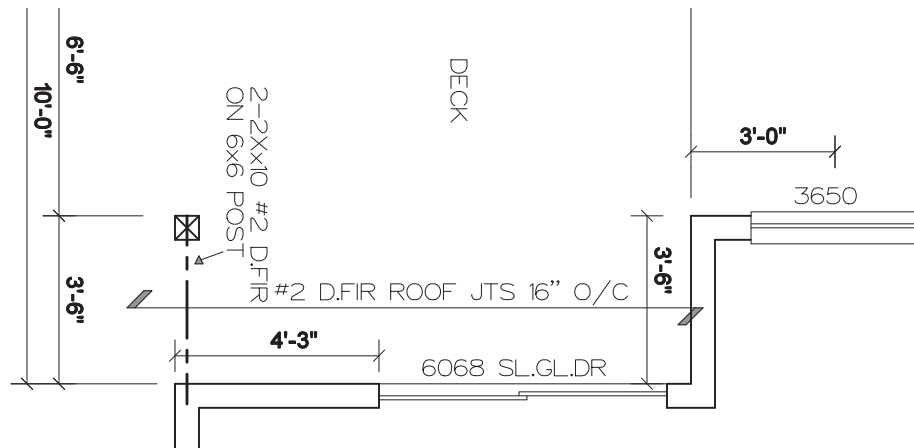


Figure 11 – Joist line with end flags

Symbols and Hatching

Symbols and hatching are used to identify objects, materials, and views. Many drawings include legends defining the symbols used.

Symbols

Symbols may be used to indicate windows and doors. When this is done, a letter or number is placed in the symbol and a window or door schedule is used to give additional information. Schedules are used for any components of the drawing that are repetitive.

For example, a circle with two parallel lines indicates an electrical duplex outlet, and one with four short lines at 90 degree increments represents a light fixture (see Figure 12).

Symbols			
	Class B vent	\$	Switch
	Exhaust vent		Floor drain
	Duplex outlet (300 mm high)		Hose bib
	Duplex outlet (height as noted)		Solid wood bearing
	Weatherproof duplex outlet	SA 	Smoke alarm (interconnected)
	Heavy duty outlet	PL 	Point load
FA	Flat arch	CD 	Carbon monoxide detector
FG	Fixed glass	GT	Girder truss
AFF	Above finished floor	DT	Double truss
	Light fixture (ceiling)	TJ	Triple joist
	Light fixture (pull chain)	PT	Pressure treated lumber
	Light fixture (wall mounted)	LVL	Laminated veneer lumber
	Light fixture (pot light)	MC	Medicine cabinet

Figure 12 – Symbols

NOTES

Toilets, sinks, and other plumbing fixtures are usually represented in a drawing with symbols (Figure 13).

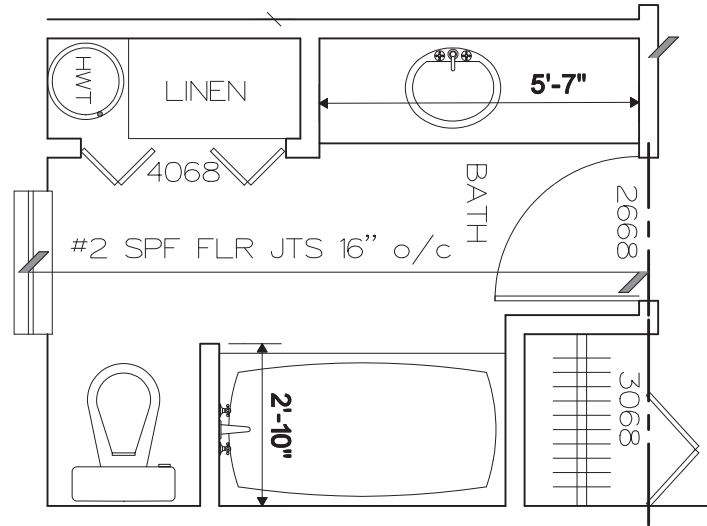


Figure 13 – Plumbing symbols

Hatching

Hatching is normally used to fill the space contained by object lines. They indicate the material used and make the drawings easier to interpret. Hatching may be used in a foundation plan to show the location of a wooden pony wall, or in a floor plan to show insulation or brick veneer for an exterior wall. In a section drawing, small dots and triangles or large dots are used to represent concrete. Soil is shown using a double woven pattern. Renovations will show wood hatching to indicate which walls are to be altered.

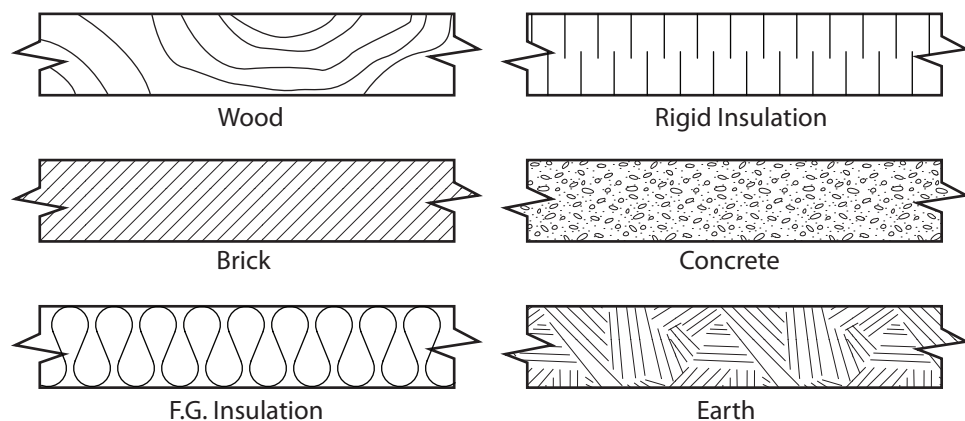


Figure 14 – Hatchings

Abbreviations

Abbreviations are used within drawings rather than full words since space is often very limited. For example, “F.D.” is used for “Floor Drain.” “T.O.W.” and “T.O.F.” are used in foundation drawings to represent “Top of Wall” and “Top of Footing.” “I.P.” is used for “Iron Pin” on site (plot) plans.

a.w.p. = acoustic wall panel

B.O. = by others

CB = chalk board

CG = corner joint

cj = control joint

conc. = concrete

Cpt. = carpet

CT = ceramic tile

C.U.H. = cabinet unit heaters

D.F. = drinking fountain

D.S. = downspout

F.D. = floor drain

F.G. = fibreglass

F.R.R. = fire resistance rating

G.B. = gypsum board

H.S. = hydration station

lino = linoleum

L.W.S. = linear wood (ceiling) system

N.I.C. = not in contract

N.C.V. = non combustible void

O.H. = over head

p = paint/stain

Plam. = plastic laminate

Plc. = polished concrete

Ply = plywood

R = rubber

R.O. = rough opening

R.W.L. = rain water leader

SAM = self adhering membrane

SB = smart board

SG. = sandblasted glass

st. = steel

TB = tack board

TWS = tactile warning strip

u.n.o. = unless noted otherwise

WB = white board

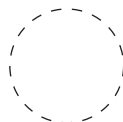
W.F.S. = water filling station

W.G.L. = wired glass in metal frames

W.R. = waste receptacle



elevations
(finished)



dia. turning
circle

Figure 15 – Sample legend of abbreviations

NOTES

NOTES

Using Symbols and Abbreviations

Do not guess if you don't know for sure what the symbol or abbreviation stands for. For example, "K.D." can stand for "Kiln Dried" or "Knock Down." When in doubt, contact the person who drew the plans. (The title block will usually include the phone number of the person or firm who drew the plans.)

Most books on reading and understanding construction drawings have comprehensive lists of line types, symbols, hatchings, and abbreviations.



Now complete Self Test 2 and check your answers

Self Test 2

1. Centre lines are composed of:
 - a. short dashes
 - b. long lines with Z breaks
 - c. light solid lines
 - d. a long dash followed by a short dash
2. Object or visible lines are made darker than dimension lines.
 - a. true
 - b. false

Refer to Figures 1–4 when answering questions 3 and 4.

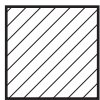


Figure 1

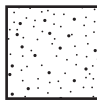


Figure 2

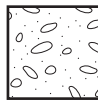


Figure 3

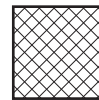


Figure 4

3. Concrete is shown in:
 - a. Figure 1
 - b. Figure 2
 - c. Figure 3
 - d. Figure 4
4. Brick masonry is shown in:
 - a. Figure 1
 - b. Figure 2
 - c. Figure 3
 - d. Figure 4
5. The symbol in Figure 5 is a:
 - a. range outlet
 - b. duplex outlet
 - c. pull switch
 - d. three-way switch

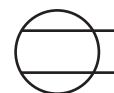


Figure 5

6. The symbol in Figure 6 stands for:
- a. earth
 - b. plywood
 - c. finish wood
 - d. wood framing



Figure 6

7. Using the Ladysmith Vacation Cabin plans found at the beginning of Binder 1, list the hatchings and abbreviations found on each of the following drawings:

- a. Site Plan

- b. Foundation Plan

- c. 1st Floor Plan

- d. Section B – B

LEARNING TASK 3

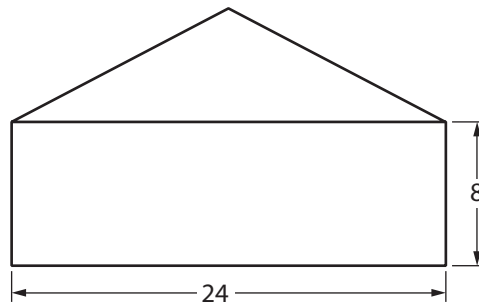
NOTES

Describe the Scales Used in Drawings

Communication between designer and builder is primarily done with the drawings the designer prepares. It's very important that the drawings include enough information to allow the builder to construct the building as the designer intended.

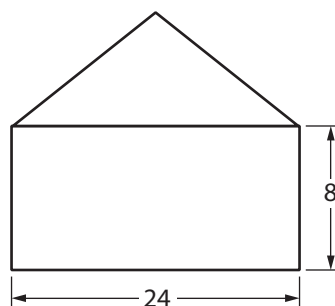
Drawings are also used to obtain building permits. When used for this purpose, they meet the municipality's requirements.

One of the reasons construction drawings are useful is that they're drawn to scale. When drawn to scale, the proportions of a building are shown correctly. When not drawn to scale, the drawing will not represent the true shape of the building. Figures 1 and 2 show two drawings of the same 24' wide and 8' tall building—Figure 1 is drawn to scale and Figure 2 is not drawn to scale (NTS).



Drawn to scale

Figure 1 – 24' wide and 8' tall building drawn to scale



Not drawn to scale

Figure 2 – 24' wide and 8' tall building not drawn to scale

Although both drawings show the same building, Figure 1 more accurately shows the actual shape of the building, particularly the slope of the roof.

NOTES

Drawing to scale makes it easier for the builder and owner to visualize the final structure.

Typical Scales

The scale of a drawing determines the size of paper needed. Floor plans for the main floor and second floor of a 1200 square foot house will easily fit on a sheet of 36" × 24" paper if drawn at a scale of ¼" = 1'0". At this scale, the required details are able to be seen easily. However, if the same plans are drawn at a smaller scale of ⅛" = 1'0", the drawing will be much smaller and it will be more difficult to show the same level of detail.

Note that even though a scale of ½" = 1'0" (1:24) is only twice as large as ¼" = 1'0" (1:48), it will result in drawings that are four times the size (since the larger scale increases both the vertical and horizontal distances). Large scales are used when a lot of detail must be shown, such as a cabinet or stair design detail. Small scales are used when a large area needs to fit on the paper, such as a site (plot) plan.

Standard Scales

Over time, standard scales have evolved for different types of construction drawings. In early years, drawings were drawn to scales of 1:100, showed little detail, and left much of the fine detail up to the builder to work out. Drawings now show more detail and include more specifications. This allows the builder to bid accurately on the cost of construction while still meeting the designer’s expectations.

The following table shows standard scales used for construction drawings.

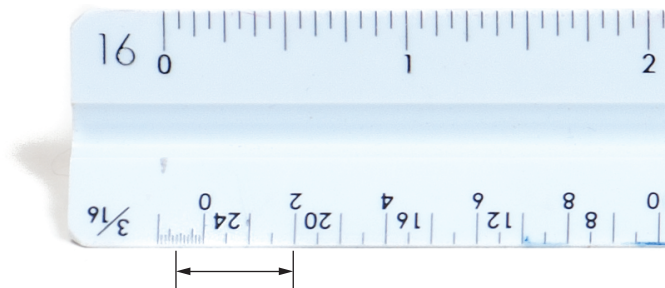
STANDARD SCALES		
<i>(Metric to imperial scale conversions are not exact)</i>		
Type of drawing	Metric scale	Imperial scale
Site Plans	1:200, 1:500	¼" = 1'0"
Details	1:20, 1:10	½" = 1'0"
Residential Floor Plans	1:50	¼" = 1'0"
Residential Elevation Views	1:50	¼" = 1'0"
Residential Cross Sections	1:50	¼" = 1'0"
Commercial Floor Plans	1:50, 1:100	¼" = 1'0", ⅛" = 1'0"
Commercial Elevation Views	1:50, 1:100	¼" = 1'0", ⅛" = 1'0"
Commercial Cross Sections	1:50, 1:100	¼" = 1'0", ⅛" = 1'0"

Figure 3 – Standard scales

Scale Rules

Scale rules, sometimes called rulers or scale sticks, are made for all common metric and imperial scales. The imperial scale is known as the architectural scale.

Imperial scales read with different scales on the same face, one reading from left to right, and the other reading from right to left. The imperial scale also has a finely graduated scale at the beginning for accurate measurements of less than one foot.



2" -7" represented on the 1/4" scale (1/48 original size)

Figure 4 – 1/4" = 1'0" scale rule

Determining the Scale of a Drawing

When working from construction drawings, it's important to know the scale of the drawing. If unsure of the scale, derive it by comparing the actual size of a component to its dimensions on the drawing.

For example, consider the drawings shown in Figures 1 and 2 (where no actual scales are given). If you measure each drawing, you'll see that Figure 1 is a little over 2 1/4" wide and approximately 3/4" tall. Figure 2 is a little under 1 1/2" wide and approximately 3/4" tall.

To find the approximate horizontal scale of Figure 1, compare the **measured** width of the building (2 1/4") with the **given** width of the building (24'). Since 24' = 288", the approximate horizontal scale is 2 1/4 : 288 or 1:128.

Use the same method to determine the vertical scale, as well as both scales for Figure 2:

	Approximate horizontal scale	Approximate vertical scale
Figure 1	2 1/4" = 24' 0" (1:128)	3/4" = 8' 0" (1:128)
Figure 2 (NTS)	1 1/2" = 24' 0" (1:192)	3/4" = 8' 0" (1:128)

(Note that since Figure 1 was drawn to scale, the horizontal and vertical scales are the same. However, since Figure 2 was not drawn to scale, the horizontal and vertical scales are different.)

NOTES

NOTES

Scaling from Drawings

If measurements are missing on construction drawings, you can find them by “scaling”. “Scaling” a measurement from a drawing means using a tape measure or scale ruler to measure the distance on the drawing and then applying the stated scale to calculate distance.

For example, if the distance from the outside corner of a building to the centre of a window is missing or appeared to be wrong, measure the distance and then apply the scale. If the distance measured is $1\frac{1}{4}"$ and the scale is $\frac{1}{4}" = 1'0"$ (1:48), then the centre of the window should be 5' from the outside corner of the building ($1\frac{1}{4}" \times 48 = 60" = 5'$).

Scaling should be used only as a last resort because a scale drawing is distorted by reproduction and measurements obtained are often inaccurate. For example, if the distance measured in the above example is $1\frac{5}{16}"$ (rather than $1\frac{1}{4}"$), the centre of the window would be placed at 5'3" from the centre of the building, a difference of 3"!



It's best to calculate or call the architect for important missing dimensions and not to scale from the drawing unless absolutely necessary, and also be aware that the scaled dimension may not be accurate.



Now complete Self Test 3 and check your answers

Self Test 3

Part One

Using *Understanding Construction Drawings for Housing and Small Buildings*, complete the Chapter 2 exercises on reading metric and imperial scales.

Part Two

1. What is the scale of a drawing if a measurement on the drawing is 2 ½" and the dimension for that part of the building is 10'?

2. What is the scale of a drawing if a measurement on the drawing is 125 mm and the dimension for that part of the building is 12 500 mm?

3. If a drawing is enlarged or reduced by photocopying, does the scale remain accurate?

4. What is the standard scale for floor plans for commercial buildings?

5. What scales are site plans usually drawn to?

6. What does it mean when drawings are not drawn to the correct proportions?

7. Which scale is larger, 1:48 or 1:96?

LEARNING TASK 4

NOTES

Describe the Parts of Architectural Drawings

Architectural drawings are a collection of many drawings, that together make up a working set of drawings for building a structure. The main parts of the drawings include the following:

- plot plan
- foundation plan
- floor plan
- elevations
- sections
- detail drawings

As you learned in Learning Task 1, a plan view is a top-down view from directly overhead. The plot plan, foundation plan, and floor plans are all plan views. Elevations, sections, and detail drawings are not plan views. Elevations should be referred to as “elevations” or “elevation drawings,” but not “elevation plans.”

Some sets of drawings will also have roof plans and floor framing plans when needed for clarity. These are frequently provided by the truss company that supplies the roof and floor packages for the project. They’re primarily needed for inspection and liability purposes.

Plot Plan

The site (plot) plan is a small-scaled drawing, showing the location of the building or structure and the distances between the building and the property line (known as setbacks). It shows existing buildings and trees that are to stay, and it usually shows walkways, driveways, and any retaining walls. Contour lines may be included to indicate an elevation that falls on that line.

Information for the plot plan is taken from the survey plan provided by the owner or from a subdivision plan. In most cases, the owner will engage a surveyor, registered in the province, to lay out and mark the boundaries of the property and record the information on a drawing called a survey plan. The building contractor uses both the survey plan and the plot plan to locate the building on the site. This critical step ensures the correct location of the building. The surveyor may also be required to establish elevations for natural grade in cases where the building will be close to the maximum height allowed by the zoning bylaw.

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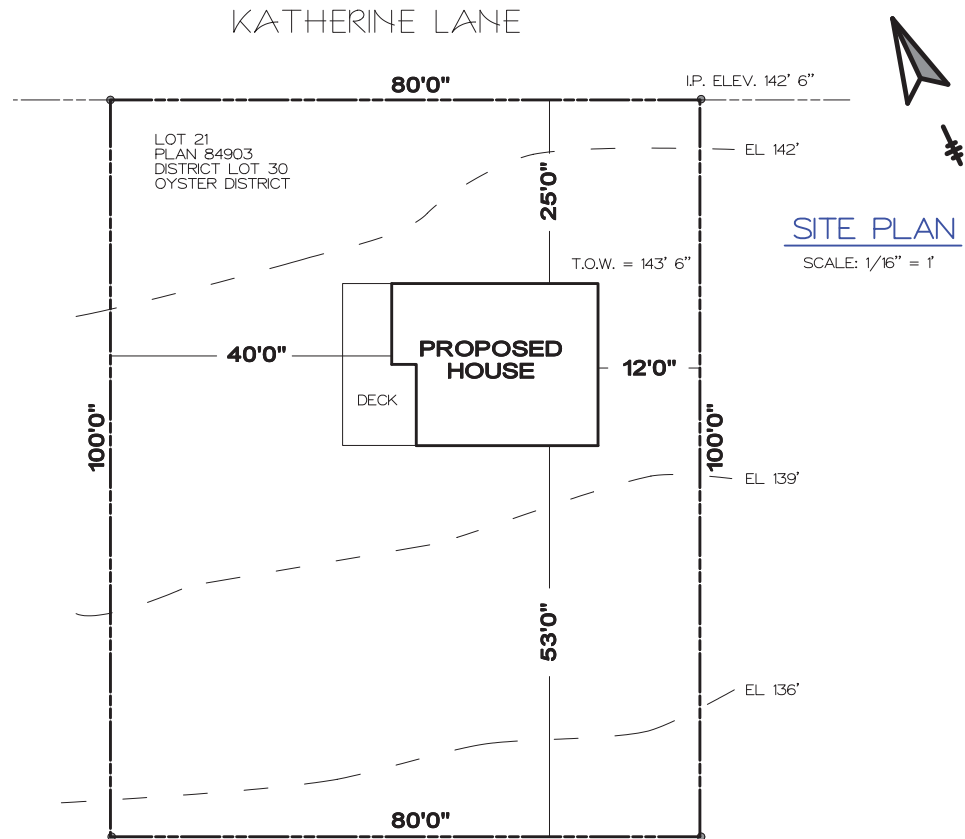


Figure 1 – Site plan showing setbacks, legal description, arrow north, and iron pin

Plot plans usually include the property's legal description, the road location and name, an arrow north, and a benchmark for determining foundation heights. Typically an iron pin (I.P.) is used as a benchmark.

Foundation Plan

Foundation plans provide information about the size and location of all the footings, necessary reinforcing steel, and the type and strength of concrete to be used. These plans also detail the foundation wall construction, columns, pilasters, and other concrete structures used in the foundation. The elevations of the bottoms of the footings and the elevations to the top of the walls and columns are also provided on the foundation plan.

The foundation plan may be part of either the architectural drawings or the structural drawings. It often has many notes about the quality of the concrete and reinforcing steel, as well as the positioning of the reinforcing steel. Anchors for beams, walls, and seismic hold-downs are also indicated on the foundation plan.

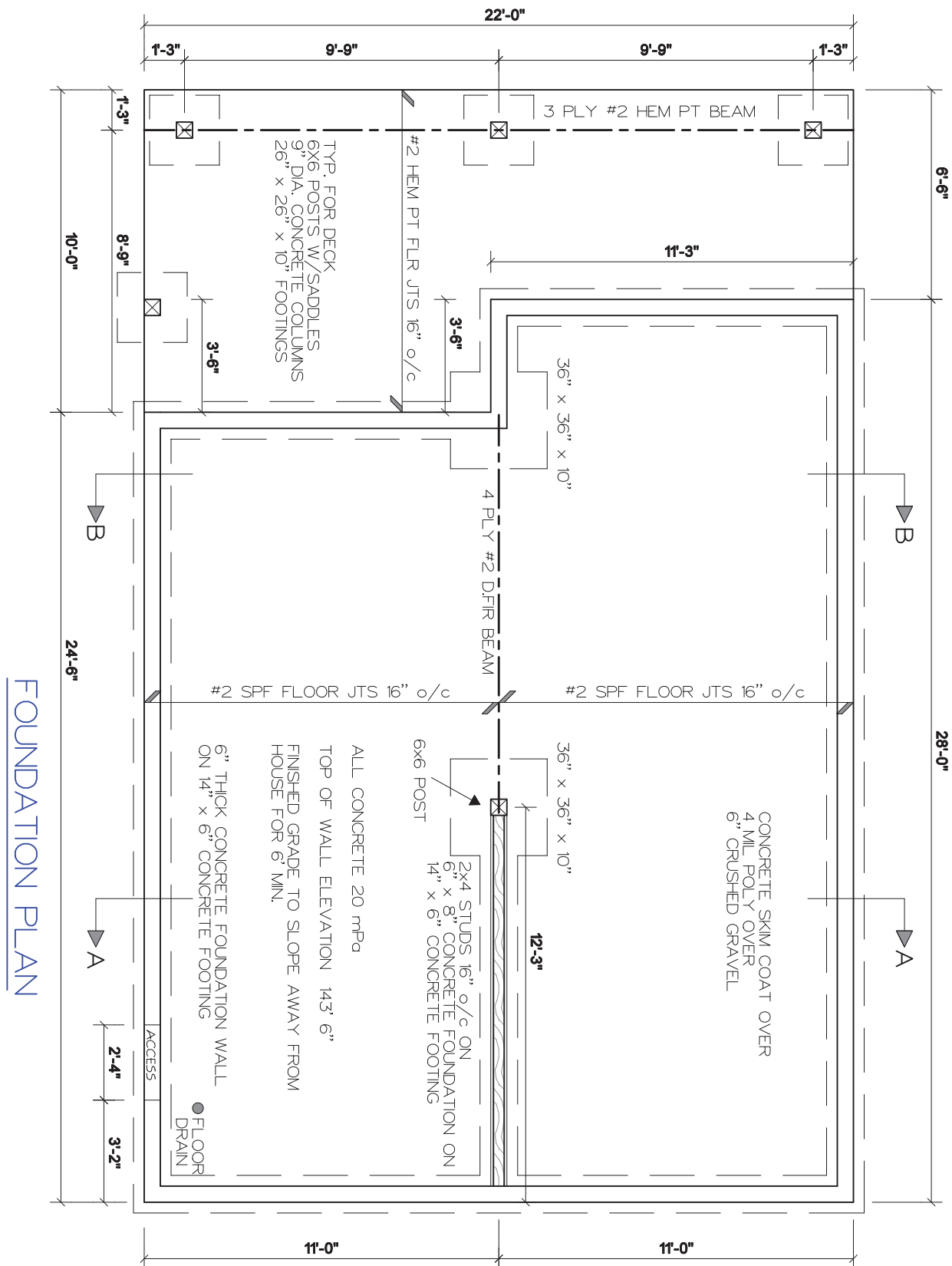


Figure 2 – Foundation plan

Floor Plan

Floor plans are among the most important drawings of a set, as they provide the most information about the building. They give all the room dimensions as well as the overall dimensions; the size, location, and swing of all doors and windows; and the size and spacing of the joists and beams overhead. They also show the location of the cabinets for the kitchen and bathroom, the location of any other cabinets in the building, the location of plumbing fixtures, and the position of closet rods and shelves. They identify rooms by name or number.

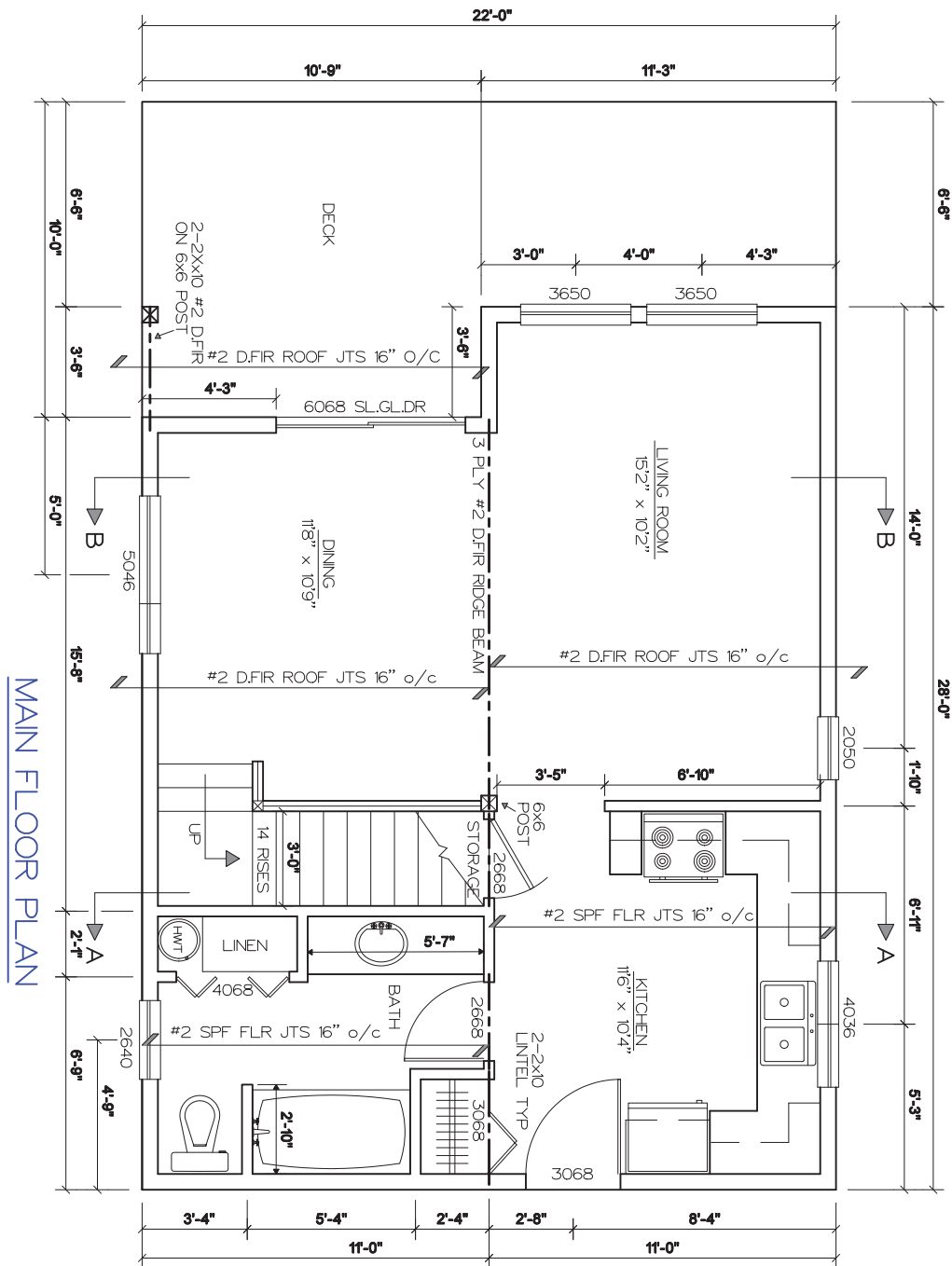


Figure 3 – Floor plan

Elevations

An elevation is a view of any vertical surface and is taken from the floor plans. It shows how the exterior of the building will look when finished. The elevation shows the finished grade line, the finishing materials, and door and window locations. They also show roof slopes and projections, decks and railings, and the height of the building.

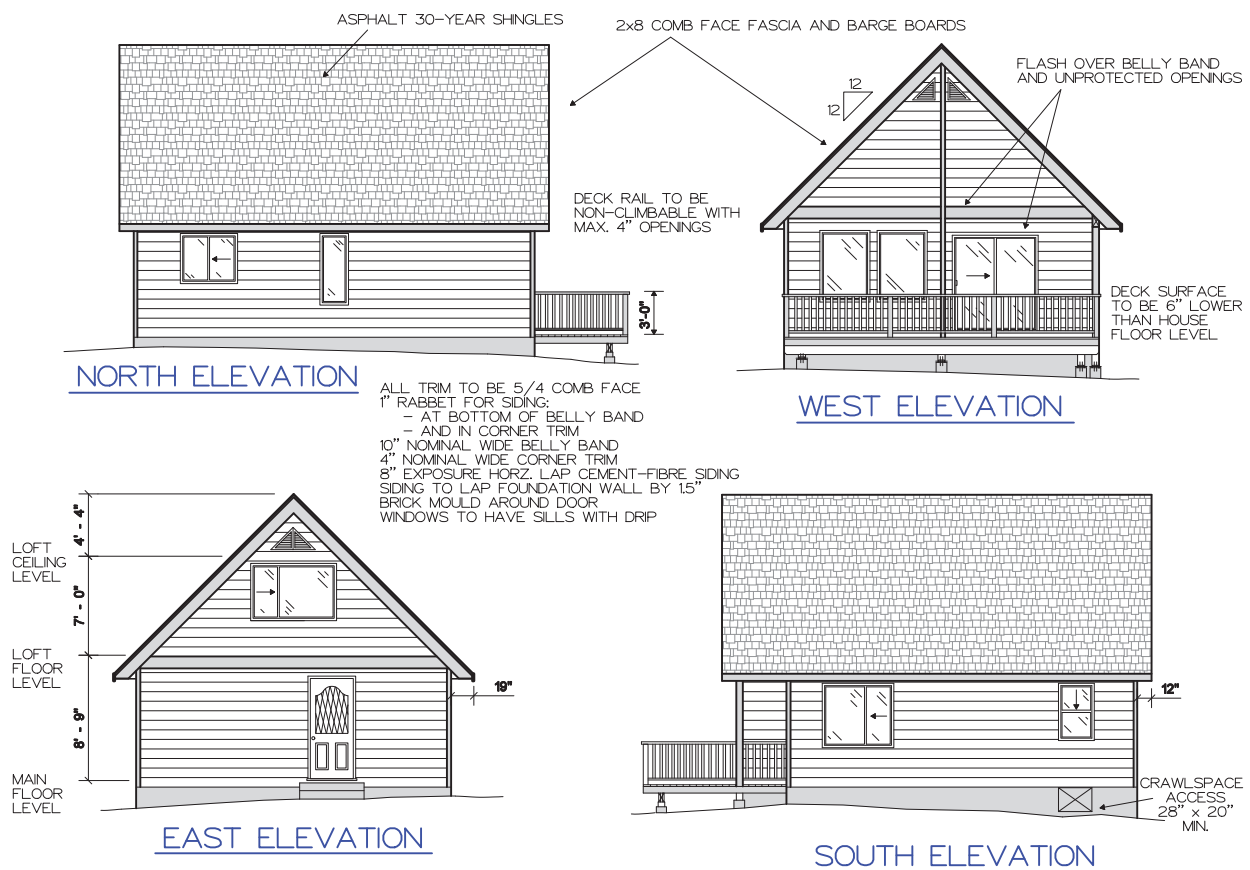


Figure 4 – Exterior elevations

Exterior elevations are usually named north, east, south, and west; or front, right, rear, and left (front is the side facing the road).

Interior elevations may be used to show interior walls with special features such as a fireplace, kitchen cabinets, or washroom fixture location (Figure 5).

NOTES

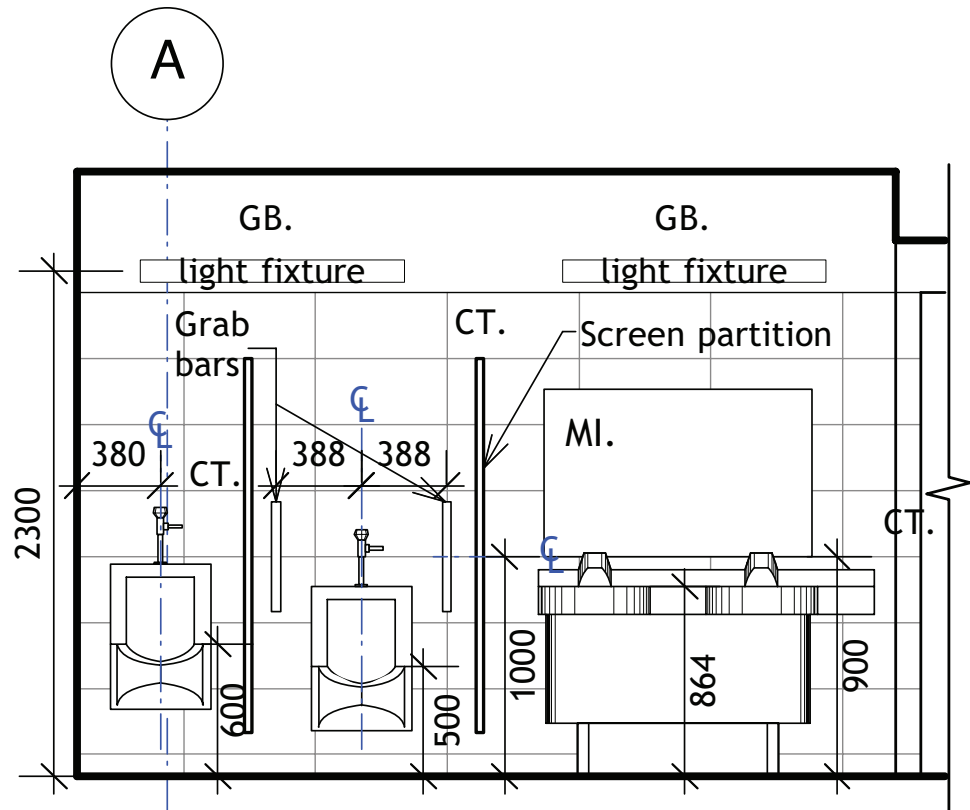
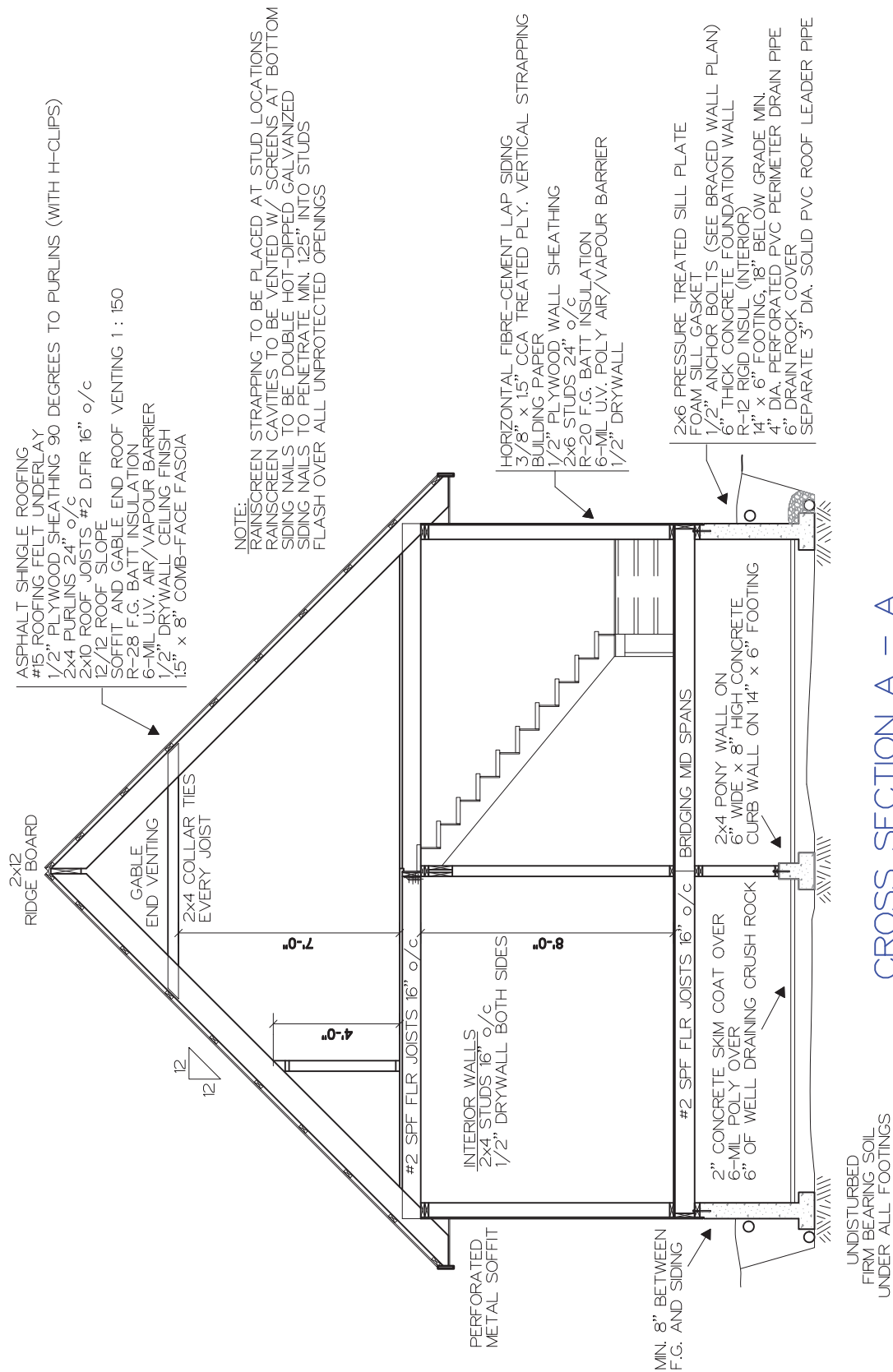


Figure 5 – Interior elevation of a men's washroom wall

Sections

Sections provide detailed drawings of the cross section of a building or wall unit. The scale of these drawings is large (about 1:20 or 1:24)—this allows different members to be drawn so that the construction details are clearly seen. Full cross sections are usually drawn to 1:50 or 1:48. They're also used to show ceiling heights and clearances.



CROSS SECTION A - A

Figure 6 – Full building cross section drawing

NOTES

Detail Drawings

Details are drawn to display more detailed information for the construction of a particular part of the building. Usually drawn to a larger scale (from 1:10 up to 1:1) to show what’s required. It’s common to see detail drawings of stairs, cabinet work, or an exterior focal point such as a timber frame porch assembly that’s popular in western platform hybrid construction.

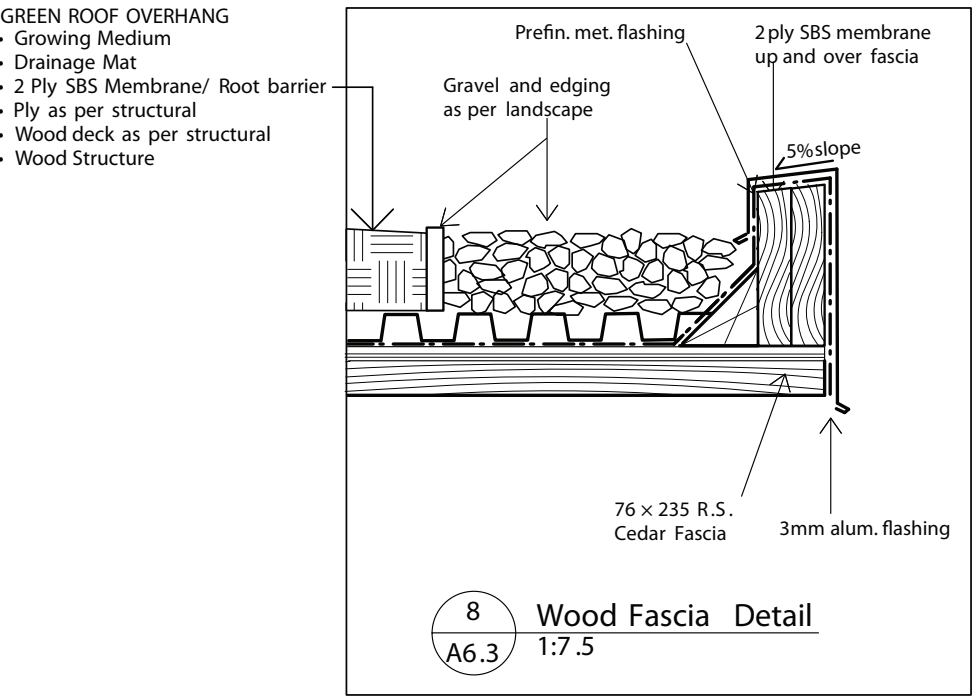


Figure 7 – Detail drawing for a green roof overhang



Now complete Self Test 4 and check your answers

Self Test 4

1. What is a plot plan used for?

2. What is a setback?

3. Why is a benchmark sometimes shown on a plot plan?

4. Which plan view could be either an architectural or structural drawing?

5. Which plan gives room names and room sizes?

6. How are elevation drawings named?

7. Why are section and detail drawings done to a larger scale?

LEARNING TASK 5

NOTES

Describe the Tools and Materials Used for Drawing Plans

A basic knowledge of the tools available and how to use them will assist when creating drawings.

Drafting Board or Table

The surface of a drafting board should be smooth. It should have a true surface, with no warps or twists. The surface of most drafting boards is covered with vinyl as this material provides an especially smooth and even surface. To allow it room to expand and contract, the vinyl should be fastened only at the top and on one side.

A drafting board or table should have two parallel outside working edges, made of either hardwood or steel. The working edges should be tested for straightness with a steel straightedge. If the edges are not parallel or straight, they should be corrected before the board is used.

Many drafting table tops are adjustable from vertical to horizontal and can be set at different heights from the floor and at any angle from vertical to horizontal. Other drafting tables may not have the same adjustments and can be tilted only from a horizontal to a low slope.

To reduce back strain, adjustable drafting stools (with or without backs) should be used with drafting tables. Tables or boards should be a minimum of 1220 mm in width and 915 mm in height (48" × 36").

T-square

The fixed-head T-square is used for ordinary work. It should be made of hardwood and have a transparent edge on the blade. The blades are usually 750–1067 mm (30–42") long.

The T-square is used to draw horizontal lines on paper—it's held tight against the left edge of the drawing board and moved up and down as required (if you're left-handed, the T-square will be held against the right edge of the drawing board). When making close adjustments, the fingers should be on top of the square and the thumb used to control its movement.

NOTES

When drawing horizontal lines, the pencil should be inclined in the direction the line is being drawn with the pencil point as close to the blade as possible. The pencil should be rolled between the fingers to prevent the point from becoming flat on one side.

For accurate work, the blade must be perfectly straight. To check the straightness of the blade, mark two points on a sheet of paper and, with the blade of the T-square, draw a line to join the two points. Then turn the blade over and draw another line to join the same two points as shown in Figure 1. If the blade is perfectly straight, both lines should be directly over each other.

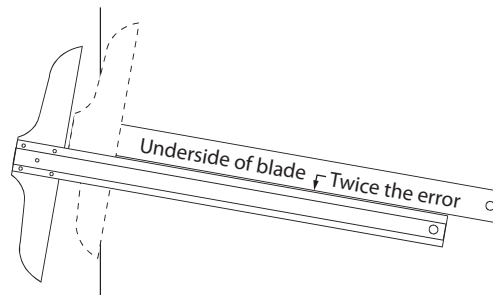


Figure 1 – Testing the straightness of a T-square

Sliding Squares and Mechanical Arms

Better quality drafting tables will have sliding squares or mechanical arms. Sliding squares work like T-squares for drawing horizontal lines, but do not need to be held against the edge of the drafting board. Mechanical squares can be used for drawing horizontal and vertical lines as well as lines at any angle.



Figure 2 – Mechanical arm

Set Squares

Set squares (triangles) are made of clear plastic with rabbeted edges so that when drawing lines in pencil or ink, the corner of the edge is set away from the tracing paper. The rabbeted edge prevents smudges and ink blotches.

Set squares are available in 45-90-45 or 30-60-90 combinations (the numbers refer to the size, in degrees, of each angle). For most work, set squares should be about 200–250 mm (8–10") long. They should be stored flat and without pressure against them to prevent warping or deforming. A set square is checked for accuracy by drawing a perpendicular line, then reversing the set square and drawing another perpendicular line (Figure 3). If the lines are exactly on top of each other, the set square is accurate. Any difference in the two lines will be twice the error.

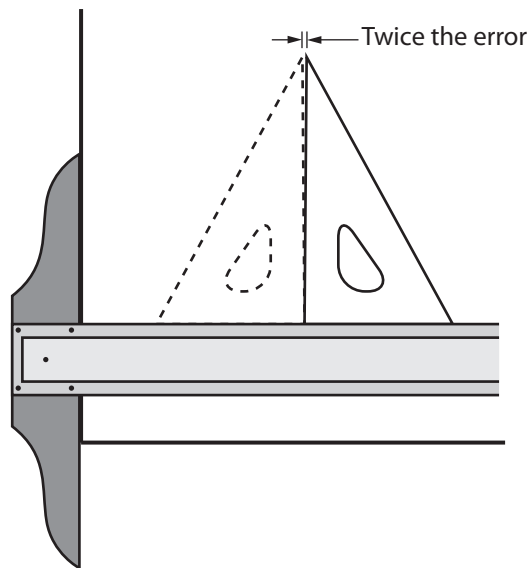


Figure 3 – Testing set squares

Set squares are used to draw vertical lines and other lines at set angles. The set square should rest on the T-square blade and slide along the blade to the desired location.

The full length of the vertical line should be drawn in one pass, if possible. The blades of the T-square and the triangle should be held together to prevent movement when drawing lines. The pencil point should be kept as close as possible to the triangle when drawing vertical or angled lines.

Using standard 45-90-45 and 30-60-90 set squares, you can also draw 15° and 75° angles by using both set squares (Figure 4).

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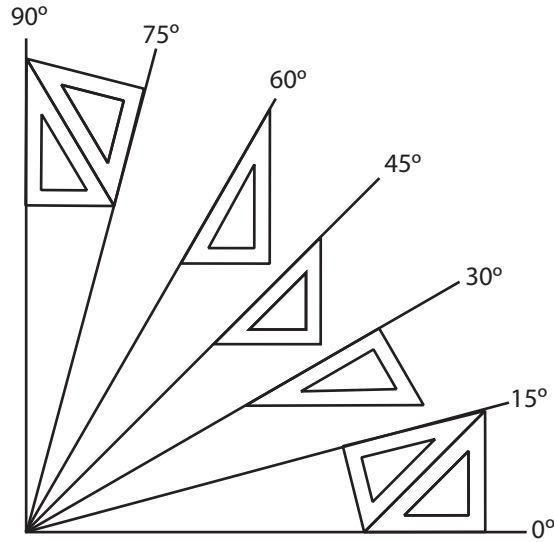


Figure 4 – Drawing angles with one or two set squares

Scales

To meet the needs of different kinds of work, scale rules come in several varieties. Most scale rules have three sides and six different scales (Figure 5). The scales are read from either end of the rule.

Scale rules that use inch-feet dimensions are specifically designed for mechanical engineers, civil engineers, and architects. Some of these scales have the inches divided into decimals of an inch or into decimals of a foot.

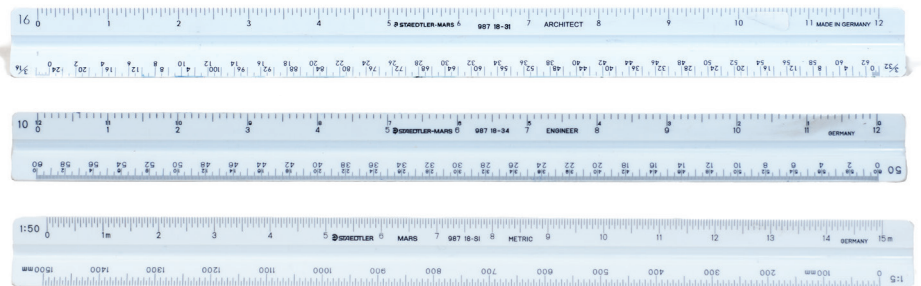


Figure 5 – Scale rules

Drawing Pencils

A drawing pencil is graded according to the hardness of its graphite (“lead”) as shown in Figure 6. This ranges from the very hard 9H to the very soft 9B (the “B” stands for “blackness”). Between the H and B grades are the F (“fine”) and HB (also known as a #2 pencil) grades.

The softer grades are used for sketching and rendering drawings. The harder grades are used for instrument drawings.

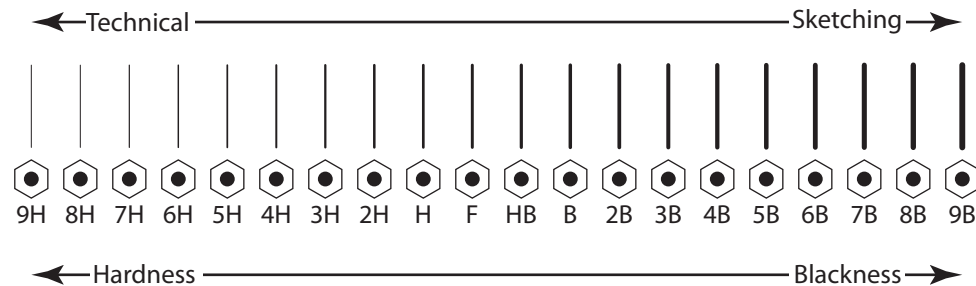


Figure 6 – Pencil hardness grades

An H, F, or HB pencil should be used to draw a border and title block. A 2H pencil is used for drawing objects such as walls and beams. 4H is used for dimensions, text, and most other lines.

Mechanical pencils hold leads that can be purchased separately. Most draftspersons use four or five different pencils with a different lead in each. (Using a different colour pencil for each lead helps keep them separate.)

Special pencil sharpeners are used to sharpen mechanical pencils (Figure 7). Thin lead mechanical pencils, with leads as small as 0.5 mm, are also available in different grades of lead and do not require sharpening.



Figure 7 – Pencils and pencil sharpener

A sanding block is sometimes used to sand the pencil's lead to a fine point.

Although referred to as “pencil lead”, lead has never been used for pencils. What is used is graphite, which was mistakenly thought to be a form of lead in the 1500s. Unfortunately, the name stuck.

NOTES

Erasers

The best eraser for drawings is the soft pink with bevelled ends, or the white plastic eraser.

A metal erasing shield confines erasures to the desired area. Erasing shields are made from very thin stainless steel and have holes of various shapes to accommodate the sections to be erased (Figure 8).



Figure 8 – Erasers and erasing shield

When an eraser gets coated with graphite, clean it by rubbing it against a soft cloth. This will prevent the eraser from transferring graphite to your document.

Cleaning Tools

It's very important to keep drawings clean. Clean graphite and other contaminants from equipment with a soft clean cloth. Your board will occasionally require cleaning—a spray-type cleaner is suitable for this purpose.

A brush should be used to sweep away eraser residue. Do not use your hand as this can leave marks on the paper. After sharpening pencils, wipe off any dust clinging to the point of the pencil to prevent smudging.

Use a cleaning pad to remove smudges from drawing or tracing papers by rubbing lightly over the entire paper.



Figure 9 – Dusting brush and cleaning pad

Templates

Trade-specific templates incorporate cut-outs of symbols and fixtures commonly used in that trade. These cut-outs make it easy to trace shapes onto drawing paper.

The templates that are most useful to carpenters are the circle template and the residential design template (Figure 10).

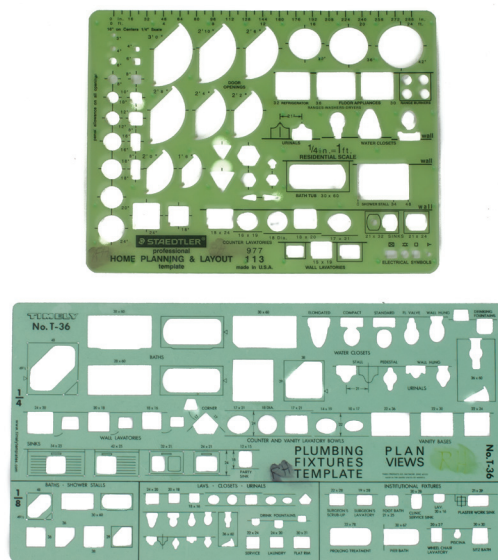


Figure 10 – Circle and residential design templates

Compasses

For larger circles that cannot be drawn with a circle template, bow or friction compasses can be used. For very large circles, a beam compass is used. Most compasses can be fitted with leads or pens. When using a compass, tilt it in the direction of the line being drawn (Figure 11).

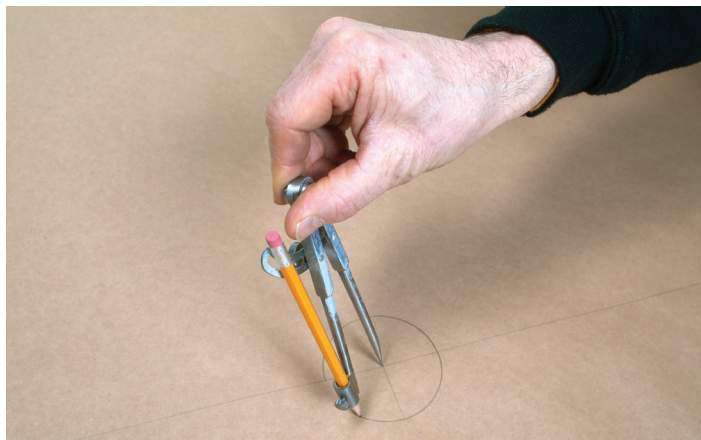


Figure 11 – Drawing circles with a compass

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NOTES

Paper and Vellum

There’s a wide variety of sizes and quality of drawing paper. Good drawing paper will not turn yellow with age. Although light-coloured drawing papers are available in pale yellow or buff, these should not be used if copies are to be reproduced.

Tracing paper, which is translucent, can be used to make copies of drawings. It’s thin enough to allow the light of copier machines to shine through the unmarked areas. Only the lines and figures will block the light. Materials used for tracing include tracing paper, vellum, tracing cloth, glass cloth, and polyester film with a matte finish.

Prints can be made from bond paper drawings, but when using bond paper for drafting paper, it’s not as strong against erasing as vellum and other drafting papers.

Standard Paper Sizes

Standard ISO series of paper sizes are as follows:

Paper designation	Dimensions
AO	841 mm × 1189 mm
A1	594 mm × 841 mm
A2	420 mm × 594 mm
A3	297 mm × 420 mm
A4	210 mm × 297 mm
A5	148 mm × 210 mm
8.5" × 11"	216 mm × 279 mm

Figure 12 – ISO paper sizes

Another paper sizing system used for plan printing is:

Paper designation	Dimensions
E	34" × 44"
D	22" × 34"
C	17" × 22"
B	13" × 19" (Super B)
B	11" × 17" (Ledger)
Legal	8.5" × 14"
A	8.5" × 11" (Letter)

Figure 13 – Plan printing paper sizes

Many grades of paper are available in rolls and in different widths that can be cut to any length required. Drafting or masking tape is used to hold the paper onto the drafting board or table. The tape should be attached at the corners to hold the sheet stretched firmly so that there are no wrinkles in the paper. Only short pieces of tape are required, 50–75 mm (2–3") long.

Borders and Title Blocks

Precut sheets with the border and the title block printed on them are also available in many standard sizes.

Title blocks are normally on the bottom of the page or on the right-hand side of the page. Figure 14 shows suggested title block sizing. Title blocks should include the name and contact information of the person or firm that drew the plans.

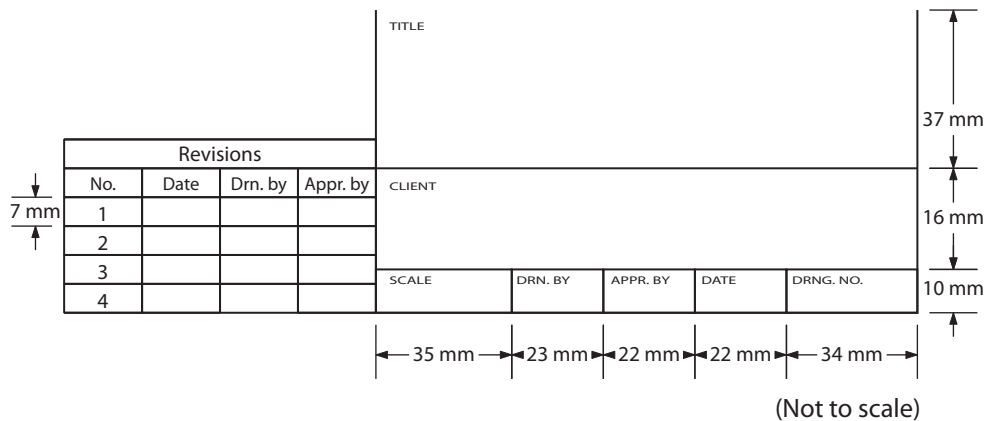


Figure 14 – Dimensions for title block

If the paper does not have a pre-printed border and title block, you'll have to draw them. The border on the left-hand side of the paper should be wider (at least 50 mm) to allow room for the prints to be bound.

Printing and Preserving

Job site copies of plans can be protected by having them laminated or printed on strong waterproof paper. The most affordable print option is to have them printed on bond (copy) paper. However, these prints will fade if left open in sunlight, they tear easy, and they don't hold up well to moisture. Inexpensive plan tubes are used for transporting and storing plans (Figure 15).

NOTES



Figure 15 – Plan tube

CADD

Most building plans are now done using computer-assisted design and drafting (CADD). There are many CADD programs available, with some being specialized for drafting building projects. The industry standard is AutoCAD. A favourite among students for drafting projects is Google's Sketchup.

Many CADD programs can generate 3-D drawings automatically. Some CADD programs allow you to draw the floor plan, and then the elevations and other drawings are semi-automatically generated along with a list of materials.

CADD programs take time to learn and have terminology all their own. They typically draw in a life-size 1:1 scale, and then you set the desired print scale. Multiple layers are used to make drawing and editing easier. For example, the electrical information can be placed in one layer which can be edited separately or temporarily hidden. Text goes in another layer and dimensions in yet another layer.

Once CADD drawings are complete, they're exported to a PDF file which is then emailed to a print shop to produce copies. PDF files can also be emailed to clients for approval or use. (Exporting to a PDF file means the client doesn't need to have CADD software.)

CADD programs are not faster to draw with than drafting by hand, but they make revisions much easier and the final result is more professional looking. Many professional draftspersons purchase their own large format printer or plotter so that they can print sample drawings in-house.



Now complete Self Test 5 and check your answers.

Self Test 5

1. What material is used to provide a smooth surface on drafting boards and tables?

2. How do you test the straightness of a T-square?

3. How do you test the accuracy of a set square?

4. Which drawing pencil has the hardest lead?

- a. 6B
- b. F
- c. H
- d. 9H

5. Which drawing pencil has the softest lead?

- a. HB
- b. 6B
- c. F
- d. B

6. What is an erasing shield used for?

7. Tracing papers, cloths, and films can be used to make reproductions.

- a. true
- b. false

8. Name two items used to keep drawing papers neat and clean.

LEARNING TASK 6

NOTES

Use Architectural Drawings

The ability to read a set of plans is a skill that requires practice to develop. It requires analytical thinking and an ability to visualize. Plan reading is often a three-step process:

1. architectural
2. structural
3. details

Architectural

The first step when given a set of construction drawings is to go quickly through all the drawings to acquire an idea of the shape of the building, the number of floors, roof configuration, and whether the foundation is for a basement, crawlspace, or slab-on-grade (SOG) construction.

The foundation plan and floor plans will give the shape of the building. The cross section drawings will confirm the number of floors and foundation type. The elevation drawings will give a good idea as to the roof design.

Consider the Ladysmith Vacation Cabin (LVC) plans—the building is rectangular with one jog on the west wall. The west half of the building is one storey and the east half has a loft above the main floor. It's on a crawlspace and the roof is steep. The cross sections show that the ceiling is vaulted except near the peak.

Structural

The second step when reading plans is to look at the structural components. Usually this is done from the top down. All roof loads and floor loads should be followed down to the footing level. This will let you know which walls are load-bearing and which are non-load-bearing.

It's standard to indicate the structural framing above each plan view. The LVC foundation plan shows the 1st level floor joists on the foundation plan, as that is the framing above the crawlspace. It shows roof joists over half the main floor (cathedral ceiling area) and floor joists over the other half for the loft floor.

NOTES

Loadbearing walls should be examined for openings, such as windows and doors. These will need small beams, which the *BC Building Code* refers to as lintels. If the opening is wide, the beam size may be large and require additional support at each end. This will affect how the walls are framed.

In addition to identifying loadbearing walls, all point loads (concentrated loads) should be identified and followed down to the footings. Point loads are located at the bearing points for beams and for girder trusses.

Look for engineered beams and trusses when studying the structural components of the building. The most common types of engineered beams are laminated veneer lumber (LVL) and parallel strand lumber (PSL). These require additional information and engineering from the supplier, which gets used in conjunction with the plans. The *LVC* plans do not have any engineered beams or trusses, but it does have two nail laminated beams for the house portion. Engineered products could be substituted for these two beams should the owner and builder choose to do so.

Details

The third step is to go back over the pages and read every notation. Many plans come with a cover sheet of general notations, with additional information provided on the following pages. You may see some of the same information in several locations, as it simplifies plan-reading to make certain things easy to find. For example, the floor joist dimension, grade, species, and on-centres (o.c.) will often be given on the foundation plan, floor plan, and section drawings.

Many of the details such as the subfloor thickness and perimeter drainage requirements will be found on the section drawings. The finishing details will be on the elevation drawings and section drawings. Details such as concrete strength (given in megapascals or “MPa”) will most likely be found on the cover sheet, foundation plan, and/or section drawings.



Now complete Self Test 6 and check your answers

Self Test 6

Use the Ladysmith Vacation Cabin (LVC) plans to find the following information:

1. The minimum crawlspace clearance under the beam

2. The type of heating

3. The on-centre stud spacing for interior walls

4. The grade and species for the deck beam lumber

5. The material type and thickness for the subfloor

6. Dimension and material type for the decking

7. The thickness of the crawlspace concrete skim coat

8. The material for the fascia boards

9. The ceiling height for the loft area

10. The roof slope

11. The type of siding

12. The closest property line setback

13. The height of the top of the foundation wall above iron pin benchmark

14. The projection of the roof past the walls

15. The size of the crawlspace access

LEARNING TASK 7

Draw Architectural Views

Learning Task 1 of this Competency covered the three types of three-dimensional (3-D) drawings:

- perspective
- oblique
- isometric

3-D drawings are also known as pictorial drawings. Hidden lines are usually not shown for these types of drawings.

Drawing a Perspective View

Perspective drawings are the most realistic of the three types. They use one, two, or three vanishing points. This Learning Task will use the simplest type: a single vanishing point.

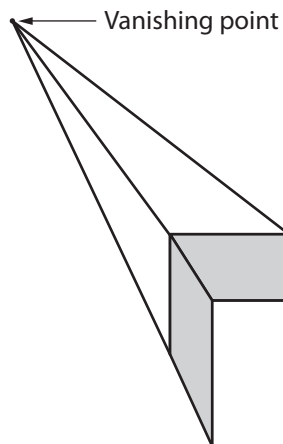


Figure 1 – Perspective drawing using a single vanishing point

The front of the object is drawn to scale as an orthographic drawing (i.e., two dimensional). An imaginary vanishing point is chosen and placed off to one side and higher or lower. In Figure 1, the vanishing point has been placed to the left and above, at about 45 degrees. The top and sides need to be shortened because of the optical illusion created by angling towards the viewer.

NOTES

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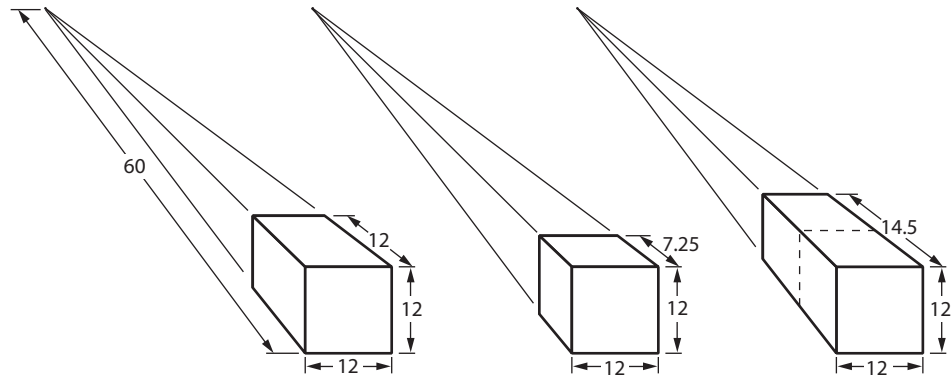


Figure 2 – Proportioning the side and top views

The example in Figure 2 is a cube measuring $12'' \times 12'' \times 12''$. The vanishing point was chosen arbitrarily to be 60" or five times the size of the cube. Looking at the drawing on the left, the front looks proportional, but the side and top look too long for a cube. By trial and error, the length was reduced from 12" to 7.25" to give a more realistic look for a cube (middle drawing).

The drawing on the right shows that if a second cube of the same size is added, we can't just double 7.25". In other words, we would have to diminish the depth to 7" or 6.75" until we achieve the correct perspective. Complex mathematical formulas have been developed for this, but typically much of this type of scaling is done by eye.

Drawing an Oblique View

At first glance, an oblique view looks similar to a perspective view. However, there's no vanishing point—all lines are drawn to their true length, measured on the axes of the projection. This type of view is relatively easy to draw. It's known as a cavalier oblique view (Figure 3). Usually a 45 degree angle is used.

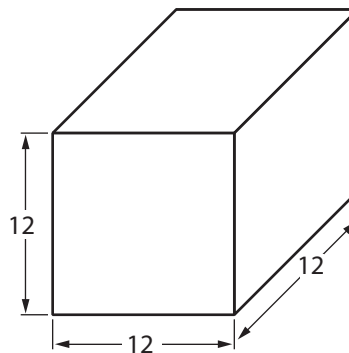


Figure 3 – Cavalier oblique view of a cube

In cabinet oblique, the lines on the receding axis are shortened by one-half their true length to compensate for distortion and to approximate more closely what the human eye sees.

NOTES

Drawing an Isometric View

An isometric view is a three-dimensional view, with the plumb lines being vertical and the horizontal lines set at 30° angles from a line parallel to the bottom of the page. Isometric views have no vanishing point, so the objects do not appear as they would in a perspective view.

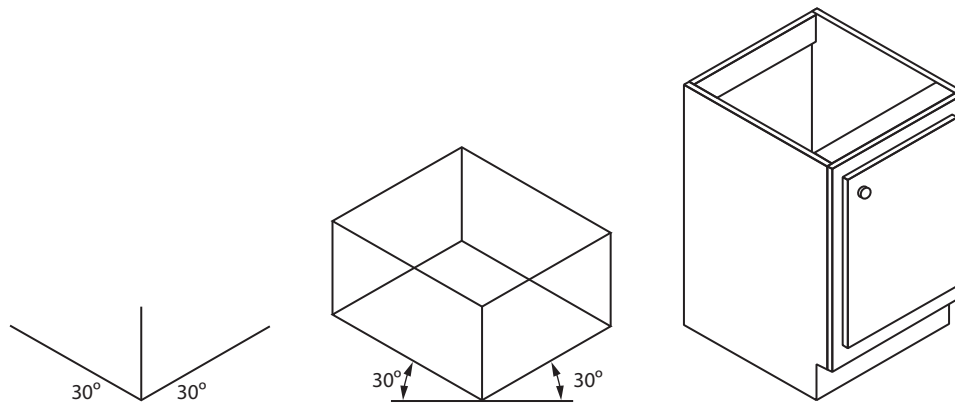


Figure 4 – Isometric views with plumb lines vertical and horizontal lines at 30° angles

Although an isometric drawing has a front, side, and top, it really appears to have two sides and a top. The 30° angles can be achieved using a T-square and 30-60-90 set square (Figure 5) or with special drafting paper.

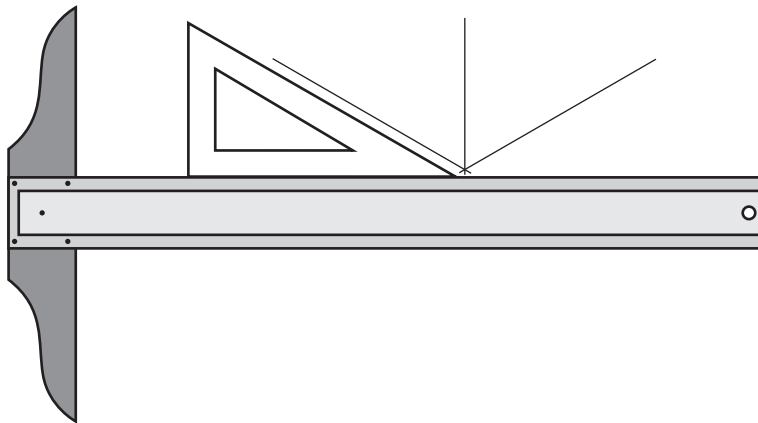


Figure 5 – Using T-square and 30-60-90 set square to draw 30° angles

NOTES

Figures 6 through 9 illustrate the process for drawing an isometric view:

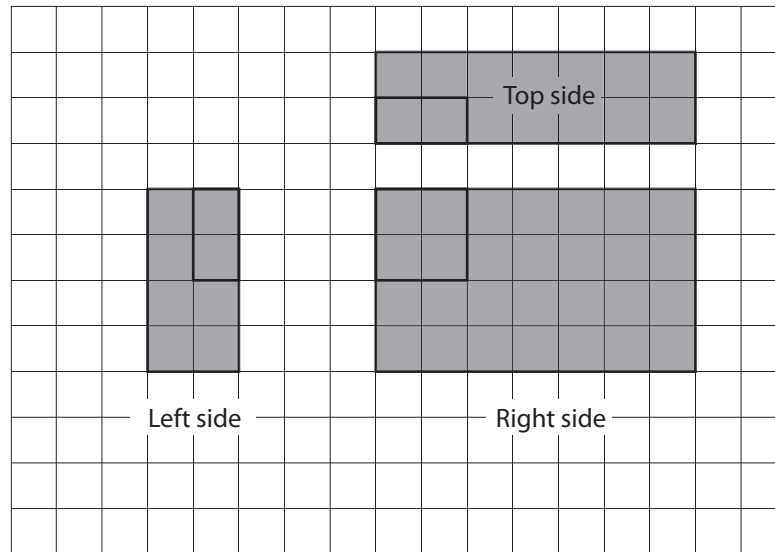


Figure 6 – The three orthographic views to be used for the example isometric drawing

Start by drawing the right side. From Figure 6, the right side is seven squares long and four squares high on the right and two squares high on the left. The first step for drawing the right side is to locate the bottom point of the drawing (Figure 7). This is the starting point. A scale rule is used for measurements or special drafting paper can be used.

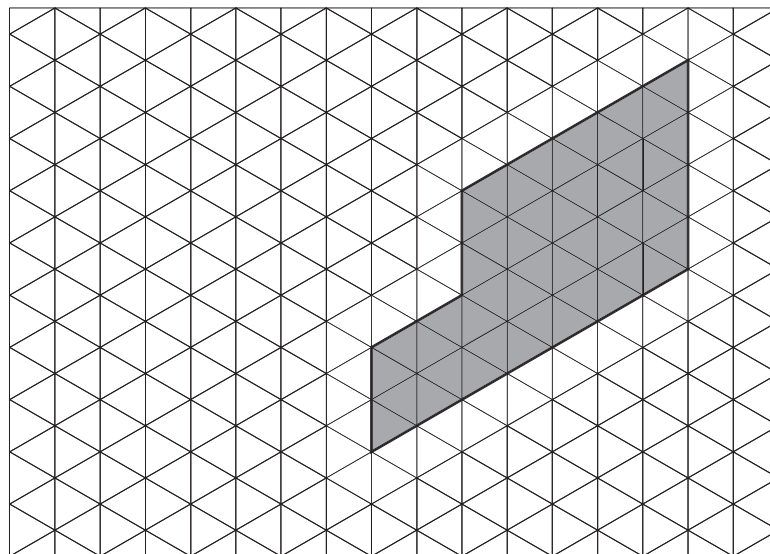


Figure 7 – Drawing the right side

The left side is drawn next (Figure 8). It's two squares wide by four squares high.

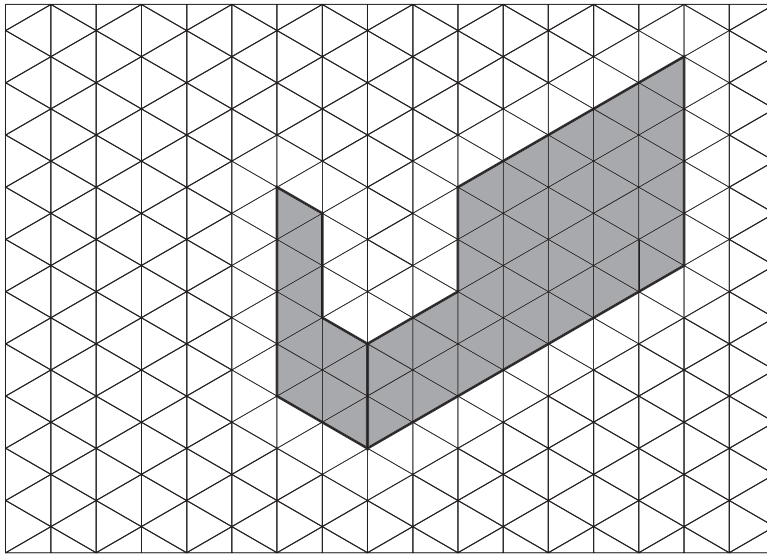


Figure 8 – Drawing the left side

The top is drawn last. From Figure 6, it's seven squares long by two squares deep. Once it's in place, the remaining three lines need to be added to complete the recessed area (Figure 9).

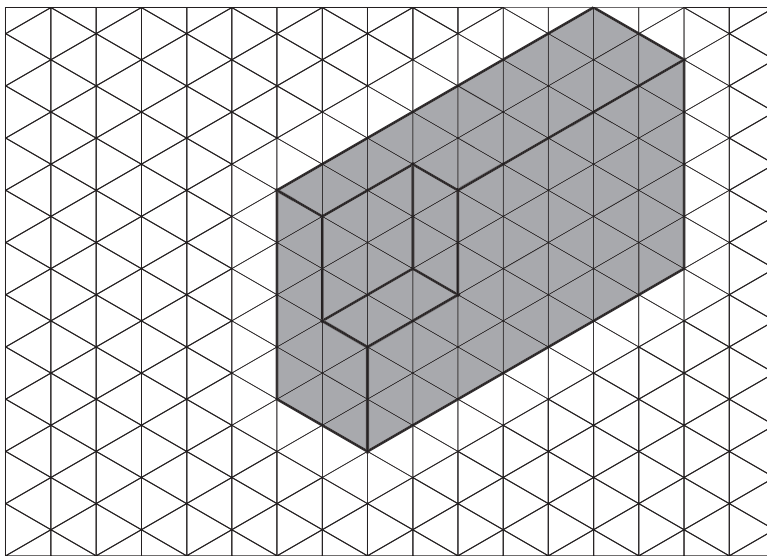


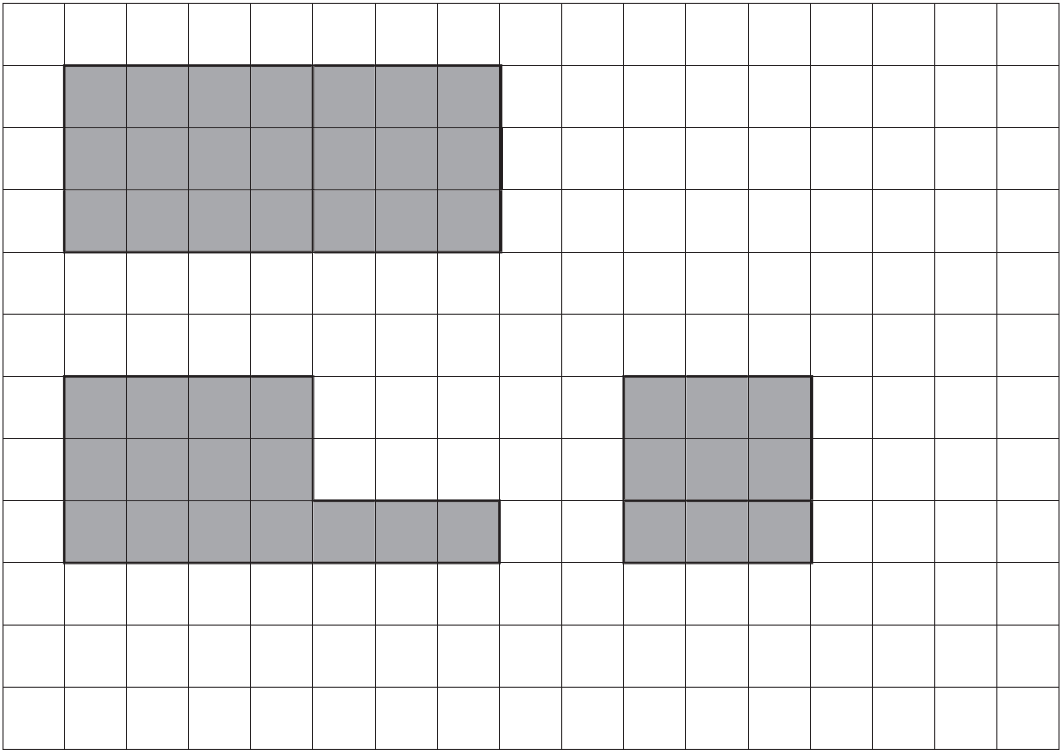
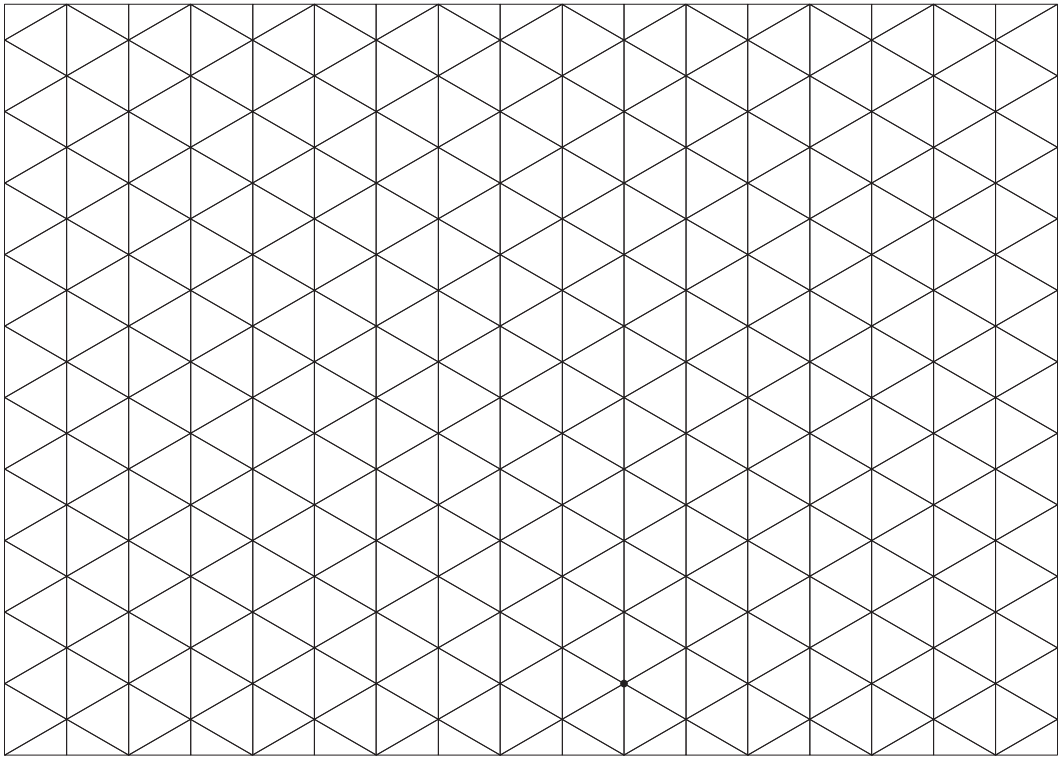
Figure 9 – Drawing the top and completing the drawing.



Now complete Self Test 7 and check your answers

Self Test 7

1. Draw the isometric view for the following:



Answer Key

Self Test 1

1. a view from directly overhead looking down
2. a. perspective
3. c. oblique
4. d. orthographic
5. c. overall design and finishing details
6. b. beam and girder details
7. yes
8. to show where the electrical and mechanical systems were installed as well as any changes that were made during construction
9. no
10. to reduce the amount of text when many of the same components are used (normally for larger buildings)

Self Test 2

1. d. a long dash followed by a short dash
2. b. true
3. c. Figure 3
4. a. Figure 1
5. b. duplex outlet
6. a. earth

7. Site Plan

I.P., EL, T.O.W., B.C.B.C.

Foundation Plan

HEM PT, #, D.FIR, MIL, o/c, mPa, POLY, MIL, FD, B.C.B.C.
wood hatching

1st Floor Plan

#, D.FIR, SPF, o/c, JTS, HWT, B.C.B.C.

Section B – B

SPF, T&G, D.FIR, o/c, MIN, B.C.B.C.

f.g. insulation hatching

rigid insulation hatching

concrete hatching

Self Test 3

1. $\frac{1}{4}" = 1'$
2. 1:100
3. No
4. Metric floor plan scales are 1:50 or 1:100, imperial floor plan scales are $\frac{1}{4}" = 1'0"$ or $\frac{1}{8}" = 1'0"$
5. Metric site plan scales are 1:200 or 1:500, imperial site plan scales are $\frac{1}{16}" = 1'0"$
6. It means that the drawing has not been drawn to a particular scale, and the finished building will not look like the drawing
7. 1:48

Self Test 4

1. to locate the building on the site
2. the distances between the building and the property line
3. to determine foundation heights
4. the foundation plan
5. the floor plan
6. north, east, south, and west; or front, right, rear, and left (front is the side facing the road)
7. so that construction details are clearly seen

Self Test 5

1. vinyl
2. To check the straightness of the blade, mark two points on a sheet of paper and, with the blade of the T-square, draw a line to join the two points. Then turn the blade over and draw another line to join the same two points. If the blade is perfectly straight, both lines should be directly over each other.
3. A set square is checked for accuracy by drawing a perpendicular line, then reversing the set square and drawing another perpendicular line. If the lines are exactly on top of each other, the set square is accurate.

4. d. 9H
5. b. 6B
6. A metal erasing shield confines erasures to the desired area.
7. a. true
8. i. dusting brush
ii. cleaning pad
iii. plan tube

Self Test 6

1. 24"
2. electric baseboard
3. 16"
4. #2 and better CCA pressure-treated hemlock
5. $\frac{5}{8}$ " thick, tongue and groove plywood
6. $5\frac{1}{4}" \times 5.5"$ radius edge CCA pressure-treated lumber spaced $\frac{1}{4}"$ apart when dry
7. 2"
8. 2×8 comb face ($5\frac{1}{4}"$ actual thickness)
9. 7'0"
10. 12/12
11. horizontal fibre-cement lap siding with 8" exposure
12. 12'0"
13. $143'6" - 142'6" = 1'0"$
14. 19" on the sides and 12" on the gable ends
15. 28" × 20" minimum

Self Test 7

1.

