

UNIT I - WORKING WITH PLANS

Lesson 1: Preparing a Plan

Competency/Objective: Read and create a simple construction drawing.

Study Questions

1. Why is having a good plan important?
2. What are the steps in making a good plan?
3. What is the definition of scale?
4. How is scale used in the drawing and interpreting of plans?
5. What are the common symbols and elements of a plan?
6. What is computer-aided drafting (CAD)?

References

1. *Agricultural Structures (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1999, Unit I.
2. Transparency Masters
 - a) TM 1.1: Architect's Scale
 - b) TM 1.2: Labeling
 - c) TM 1.3: Symbols
 - d) TM 1.4: Lines
 - e) TM 1.5: Elevation Drawings
3. Activity Sheets
 - a) AS 1.1: Reading a Plan
 - b) AS 1.2: Drawing a Plan (Instructor)
 - c) AS 1.2: Drawing a Plan (Student)

UNIT I - WORKING WITH PLANS

Lesson 1: Preparing a Plan

TEACHING PROCEDURES

B. *Introduction*

A variety of structures are used in agriculture, and they all start with a plan. This lesson will increase understanding of plans by providing an opportunity to produce a simple construction drawing. Although professionally drawn plans for nearly any conceivable project are available at a reasonable cost, the production of a plan will give a much better understanding of the information plans convey.

C. *Motivation*

Begin the lesson by writing the statement “Prior planning prevents poor performance” on the board. Ask the students for feedback about why planning is important and list their points on the board. To prompt discussion, suggest some elements to consider when planning, such as intended use, size, and style. Discuss with the students why prior planning is important, pointing out that changes to the plan can be easily accomplished, in comparison to changes made to a structure after it has been completed. Explain that a plan is a collection of information that builders use to know what a structure should look like and how to proceed.

D. *Assignment*

E. *Supervised Study*

F. *Discussion*

1. Ask students why planning is important. Reemphasize the points made in the motivation. Explain that in its final form the plan will contain all the information needed to complete the structure. Explain that the objective of a simple construction plan is to convey an overall understanding of the size and shape of the structure.

Why is having a good plan important?

- a) Provides for a useable structure that serves its intended purpose
 - b) Provides an opportunity to design the structure to meet specific needs
 - c) Saves time and money
 - d) Allows an individual to avoid the difficulties associated with situations caused by a lack of careful forethought
2. Ask students to list the steps in making a plan.

What are the steps in making a good plan?

- a) Determine and define needs.
 - b) Determine the size of the structure.
 - c) Choose the style of the structure.
 - d) Consider other factors.
 - 1) Material resources available
 - 2) Cost factors and constraints
 - 3) Building and fire codes
 - 4) Zoning laws
 - 5) Insurance and/or financial stipulations
 - 6) Safety considerations for specific structures
 - 7) Utility and service access
 - 8) Cleaning requirements
 - 9) Heating and cooling requirements
3. Ask students to define scale.

What is the definition of scale?

- a) Scale is a proportion between two sets of dimensions.
 - b) For plans, scale indicates an adjustment in the size of a drawing that reflects the size of the object being drawn.
4. Ask students to describe how they would choose a particular scale for a structure. Explain why different scales are used, pointing out that the larger the actual structure, the smaller the scale needs to be to fit on a standard page. Make sure the students understand that whatever size the scale is, it represents one foot of the actual structure. Show students the architect's scale pictured in TM 1.1.

How is scale used in the drawing and interpreting of plans?

- a) For basic plan drawing, a picture sized to fit on drawing paper is done to scale to represent the actual size of the structure being built. A system for reducing the actual size mathematically has been devised to allow for easy drawing and interpretation.
 - b) Scale may be drawn by using a triangular architect's scale; it combines the eleven commonly used scales on one tool.
 - c) A regular ruler may also be used to draw a simple plan to scale.
5. Ask the class what the elements of a plan are. Use TM 1.2 to explain where and what information will be required on drawings. Show students TM 1.3. Explain that symbols are used in drawings as a convenience to represent different items contained in a drawing. Use TM 1.4 to illustrate the types of lines found on plans. Discuss

the use of elevation drawings, showing the class TM 1.5. Have students complete AS 1.1.

What are the common symbols and elements of a plan?

- a) Elements are the different parts of the drawing that convey information or enhance the information provided.
 - 1) Information in the blocks provided in the title box
 - (a) Name of the person drawing the plan
 - (b) Title of the project
 - (c) Date
 - (d) Scale
 - 2) Symbols - pictorial representations of information that are included on the drawing
 - (a) Symbols that may be subject to the same scale as the rest of the drawing and show the location of these parts of the structure
 - (1) Doors
 - (2) Windows
 - (b) Symbols representative of where devices or appliances are to be located
 - (1) Electrical fixtures
 - (2) Plumbing fixtures
 - (c) Symbols for the type or grade of materials used
 - (1) Concrete
 - (2) Steel
 - (3) Wood
 - 3) Lines
 - (a) Border line - dark line around the perimeter of the drawing paper
 - (b) Object line - used to draw the object
 - (c) Hidden line - represents material that is under other material
 - (d) Extension line - used for placing dimensions on drawings
 - (e) Dimension line - shows the size of an object
 - (f) Break line - represents an area in the structure where a section has been removed
 - (g) Cutting plane - shows where a section has been removed with arrows showing the direction from which it was taken
 - (h) Center line - shows the centers of holes and round shapes
 - b) Elevation drawings are orthographic projections of a structure as viewed from different perspectives, most commonly the top, front, and one or both sides.
6. Ask students if they know what CAD (computer-aided drafting or design) means. Emphasize that plans drawn using CAD are only as good as the drafter's skill and talent allow. CAD cannot replace the drafter's creativity; it only makes it easier to express. Have students begin AS 1.2. Evaluate the school's resources. If students have access to enough terminals with CAD capabilities and either are knowledgeable about CAD or can be taught the basics in the time allotted, using

CAD is an excellent choice. If CAD cannot be used, students may simply draw the structure described in the activity by hand.

What is computer-aided drafting (CAD)?

- a) Computer-aided drafting or design, called CAD, is a system consisting of a computer and specially designed software that does the actual drawing of plans.
- b) CAD is now the industry standard for drafting.
- c) The four main benefits of CAD over conventional hand drafting are speed, quality, ease of making changes, and communication.

G. *Other Activities*

Have each student produce a simple construction drawing for a structure of his or her choice.

H. *Conclusion*

Having a good plan is essential to producing a good structure. Developing the plan involves considering the intended use, size, and style of the structure. After these decisions have been made, a simple construction drawing with at least three elevations is created either by hand or with CAD, using an appropriate scale and elements of the drawing to represent the structure on paper.

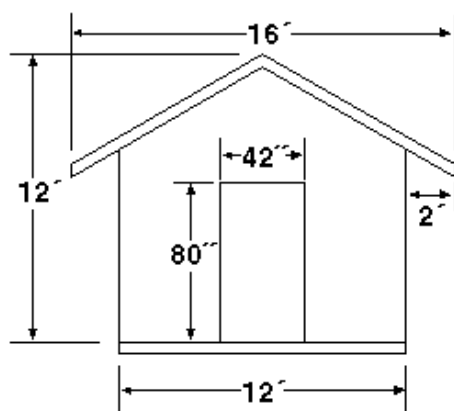
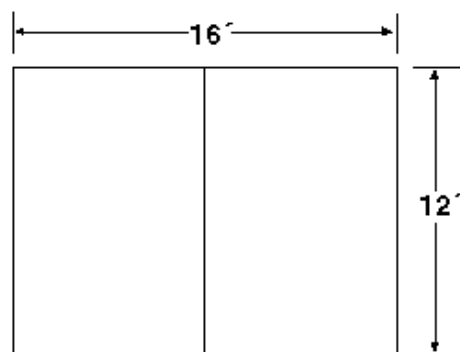
I. *Answers to Activity Sheets*

AS 1.1

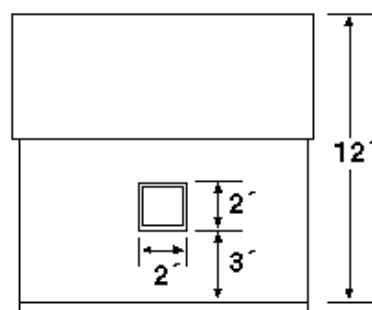
- 1. 33 feet
- 2. 4 posts
- 3. 4 feet
- 4. 6 posts
- 5. Three
- 6. Five
- 7. Four
- 8. Single pole and three way switches
- 9. Nine, including the overhead lighting for the bench
- 10. Door switch

AS 1.2

Top Elevation



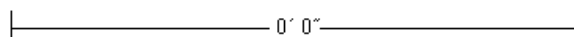
Front Elevation



Side Elevation

J. *Answers to Evaluation*

1. b
 2. b
 3. c
 4. Scale can be defined as a proportion between two sets of dimensions.
 5. Computer-aided drafting or design is a system consisting of a computer and specially designed software that does the actual drawing of plans.
 6. Answers may include any two of the following: A good plan provides for a useable structure that serves its intended purpose, provides an opportunity to design the structure to meet specific needs, saves time and money, and allows an individual to avoid the difficulties associated with situations caused by a lack of careful forethought.
 7. The four steps are as follows: determine and define needs, determine the size of the structure, choose the style of the structure, and consider other factors.
 8. Border line
 9. Dimension line
 10. Object line
 11. Answers will vary.
 12. Students
rectangle
- should draw a
measuring



1 $\frac{3}{4}$ inches by 3 $\frac{3}{4}$ inches.

EVALUATION

Circle the letter that corresponds to the best answer.

1. Symbols are:
 - a. A plan of a structure.
 - b. Pictorial representations of information placed on a plan.
 - c. Three views drawn to represent a structure.
 - d. Lines used to represent a structure.
2. Which of the following is not found on plan drawings?
 - a. Dimension lines
 - b. Tie lines
 - c. Border lines
 - d. Hidden lines
3. Elevation drawings are:
 - a. The same as blueprints.
 - b. Used to build models.
 - c. Produced in more than one view.
 - d. Drawings showing the height of a structure.

Complete the following short answer questions.

4. What is scale?
5. What does CAD mean? What is it?

6. What are two reasons why having a good plan is important when building a structure?
 - a.
 - b.
7. What are the four main steps in forming a good plan for a structure?
 - a.
 - b.
 - c.
 - d.

For each of the lines listed below, draw an example of the line beside its name.

8. Border line
9. Dimension line
10. Object line

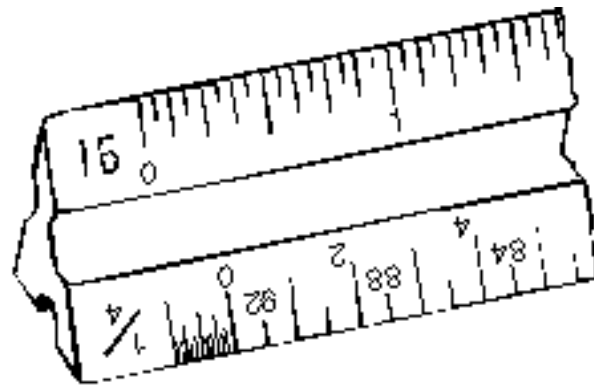
Sketch three elevation drawings (front, side, and top) for a dog house in the space below.

- 11.

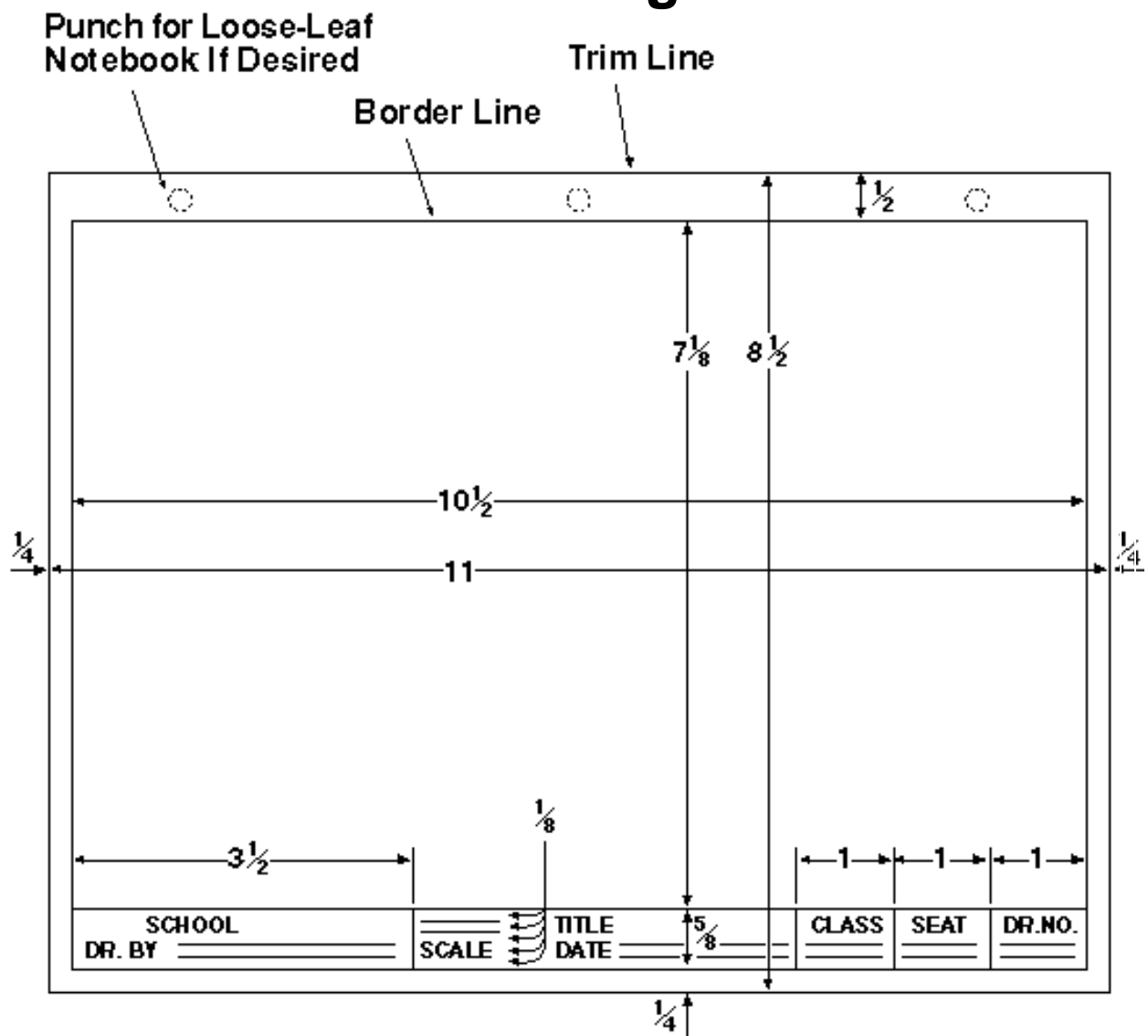
In the space provided below, use a ruler to draw a rectangle using the following scale: $\frac{3}{4}$ inch = 15 feet. The sides of the rectangle should equal 35 feet; the top and bottom of the rectangle should equal 75 feet.

12.

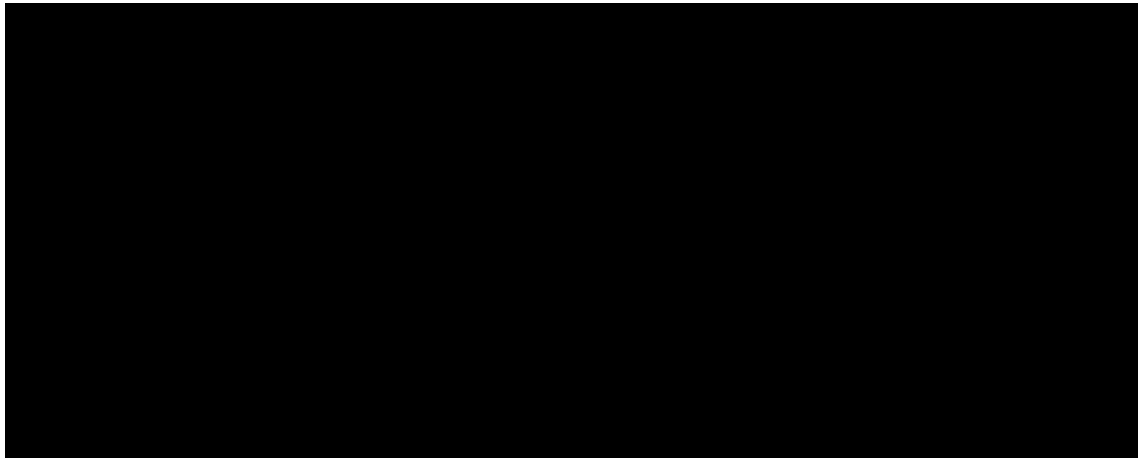
Architect's Scale



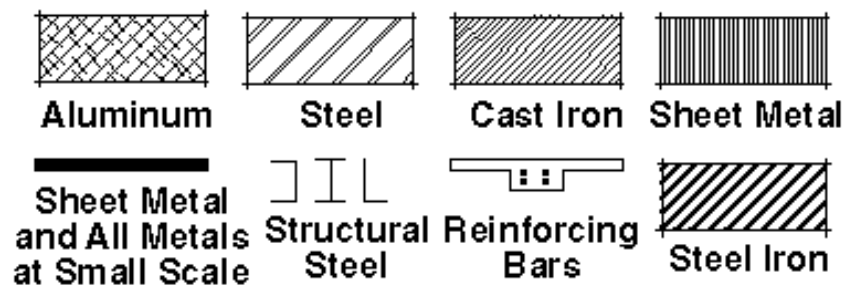
Labeling



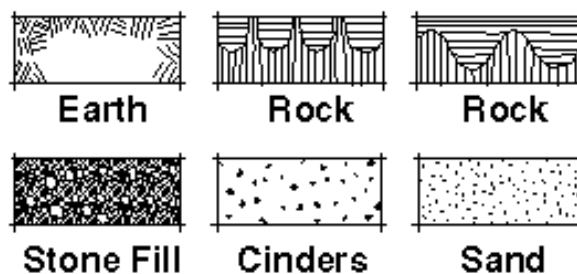
Symbols



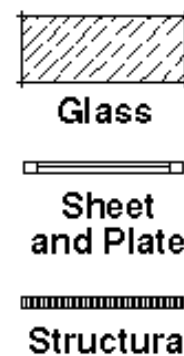
Metal



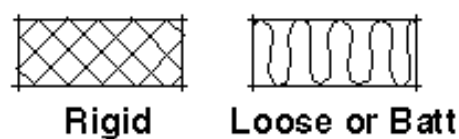
Earth, etc.



Glass



Insulation





Lines

Border

Object

Hidden

0' 0"

Dimension

Extension

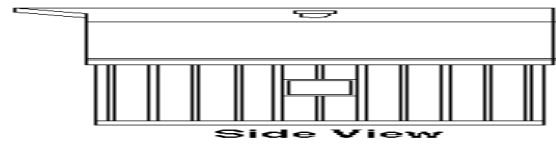
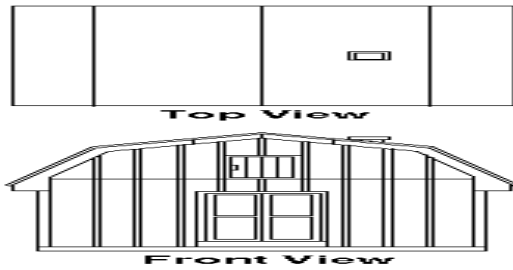
Break

Break

Cutting Plane

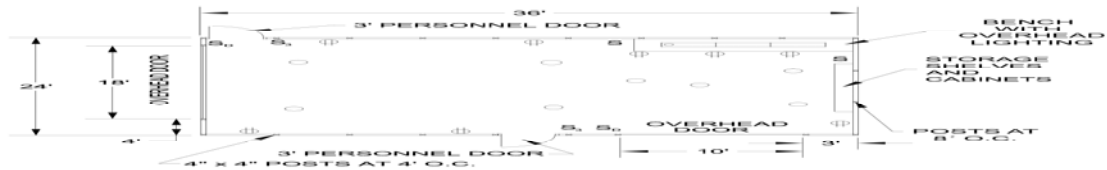
Center Line

Elevation Drawings



Lesson 1: Preparing a Plan

Name _____

Reading a Plan**Objective:** Read a simple construction plan.**Using the plan for a post frame repair shop, answer the questions.**

1. What is the length of the unbroken wall along the side with only a personnel door?
2. How many posts form the wall with no doors?
3. How long is the wall between the 10-foot overhead door and the personnel door?
4. How many posts could be removed from the building if 8-foot on center post spacing is used for the entire building?
5. How many duplex outlets are found along the work bench?

6. How many duplex outlets are found in the rest of the building?
7. How many light switches are found in the building?
8. What different types of light switches are used?
9. How many ceiling lighting outlets are included in the structure?
10. What does the symbol S_D mean?

Lesson 1: Preparing a Plan

Drawing a Plan

Objective: Draw a simple construction plan.

Materials and Equipment:

Computer with CAD software and printer (if possible)

Paper, either plain white copy paper or high rag content drawing paper (if professional hand drawing instruments are available)

No. 2 lead pencil

Ruler or architect's scale

NOTE: Professionals use several pencils with lead in a variety of hardnesses to produce exact results. A regular No. 2 pencil can be used but must be utilized with care to produce acceptable results.

Procedure:

For this activity, draw a plan for a storage building with a gable roof having two sloping sides that meet at the ridge and a floor space of 12 feet by 12 feet. The walls will be 8 feet in height on the sides, and the height from the floor to ridge will be 12 feet. The overhang, the part of a roof that extends past the walls of a structure, is to be 2 feet from the walls. The right and left side of the building should each have a window that is 2 feet by 2 feet. The windows should be centered in the side of the building with the bottom of the window 3 feet from the floor of the structure. The door should be 42 inches wide by 80 inches tall and centered in the front of the building.

1. Before assigning the activity, determine what drafting experience the students possess. Knowledge will vary, but ideally the students will have had some involvement in previous classes such as industrial technology. If students do not have much experience, working through the activity with them may be necessary. Review the following information if needed:
 - How scale is used in drawing
 - Using a separate page for each elevation drawing
 - Using border lines around the edges of the paper
 - Centering the drawings on the page
 - Using dimension lines to show the overall dimensions of the structure
2. The whole process is much less involved for the students using CAD. They will complete a plan for the same structure, but using templates and automation. If using CAD is possible, your students will need access to a computer system with CAD capabilities and a suitable printer.

3. If the plans are to be hand drawn, students will need a suitable desktop or table, although drafting tables would be better. Triangular architect's scales may be used if they are available.

Professional drawing instruments such as Bow pens, pencils and dividers, triangles, T-squares, and an assortment of pencils and inks may be available to some students. If so, excellent results may be achieved using professional quality high rag content drawing paper.

Lesson 1: Preparing a Plan

Name _____

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1. If you are drawing by hand, prepare three sheets of paper, one for each of the different elevation drawings. Neatly include the following information on each sheet in a title box: your name, title of the project, date, and scale. A sample page showing labeling is included with this activity sheet.
2. Choose a scale for the drawing that will allow it to fit in the area provided by the paper.
3. Center your drawings in the area inside the border lines. Use object lines to draw the structure. Windows and doors are to be represented by the appropriate symbols where they are to be located.
4. Dimension lines are to be used to define the measurements of the structure and/or the exact size of elements in the structure. Use dimension lines to show width, length, and height as well as the dimensions of windows and doors and the amount of overhang. These lines are to be clean and precise.

5. Draw the front elevation.
6. Draw the side elevation.
7. Draw the top elevation.

