

Unit VI – Material Selection, Plan Reading, and Interpretation

Lesson 2: Making and Reading Working Drawings

The ability to read and develop working drawings is an essential skill in agricultural mechanics. This lesson explains why a working drawing is important and describes the basic features and procedure for preparing a working drawing.

Importance of Working Drawings

A working drawing provides a detailed picture of the design of a project. Imagine how difficult it would be to build a project from a plan with only words. The project probably would take longer to build and the end result might not turn out as intended. A working drawing is a visual representation of a project that communicates a great deal of information to the builder. The symbols, lines, and dimensioning techniques in working drawings are standardized, which ensures the consistency and accuracy of the work. A working drawing of an object is also useful when a repair is needed. The drawing helps to orient the worker and ensure the accuracy of the repair. Knowing how to read and interpret working drawings allows a designer or builder to modify existing drawings or make new drawings.

Definition and Scale

A working drawing is a drawing of an object that includes all the dimensions and specifications necessary to build the object. It may or may not be drawn to scale, but the general shape and arrangement of parts in relation to each other are in the drawing. If an object is drawn to scale, all parts should be full size or in proportion to full size. The scale appears on the drawing as a ratio that represents the relationship between the size of the object in the drawing to its actual size. Examples of ratios are $6'' = 1'$ (half size) and $1/2'' = 1'$ (1/24th size). Many times the object to be drawn is too large to represent it at full size (full scale). For example, a building may be drawn at a scale of $1/4'' = 1'$ to fit it on the drawing paper.

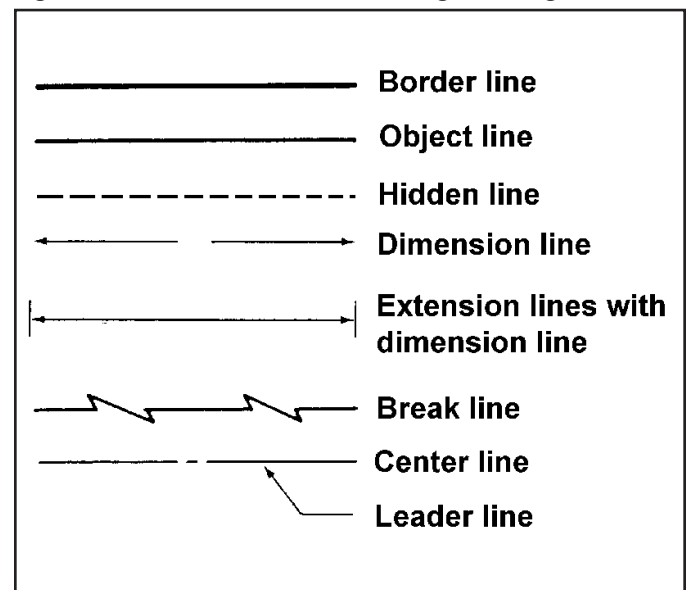
Views

A working drawing includes different views of the object to show all the parts of the object and how they work together. The number of views depends on the nature of the object. For many objects, views of the front, top, and side provide all the necessary information. Some objects, such as a round table leg, may only need an end view and a front view to provide sufficient detail. If needed, other types of views are included, such as a detail view and sectional view. A detail view provides more information about a portion of the object. A sectional view is a cutaway that reveals the interior of part of the object.

Lines and Symbols

A language of lines and symbols is used to communicate information in working drawings. Using lines and symbols makes it easier to indicate features and construction materials that would be difficult to draw. These lines and symbols are standardized so that persons who know the language can interpret a drawing done by another person. The lines differ in weight and form. Some of the commonly used lines are described in Figure 2.1.

Figure 2.1 – Lines Used in a Working Drawing



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Lines

- Border line – a heavy, solid line used to enclose the entire drawing or separate one drawing from another
- Object or visible line – a solid line used to show the visible edges and outline of the object
- Hidden line – a dashed line used to show edges that cannot be seen in the drawing
- Dimension line – a thin, solid line with arrowheads at the ends that is used to indicate the length, width, or height of an object; appear between extension lines; have a break in the center to allow room for the dimension
- Extension line – a thin line that marks the edge or corner of a part to be dimensioned
- Break line – a light, solid line with zigzags that is used to indicate part of the object has been left out of the drawing
- Center line – a thin line that is made of long, short, long segments; used to indicate the center of a round object
- Leader line – a line with an arrowhead on one end that is commonly accompanied by a note; used to point out a feature of the object

Symbols

Symbols in working drawings represent items that would be hard to draw. See Figure 2.2.

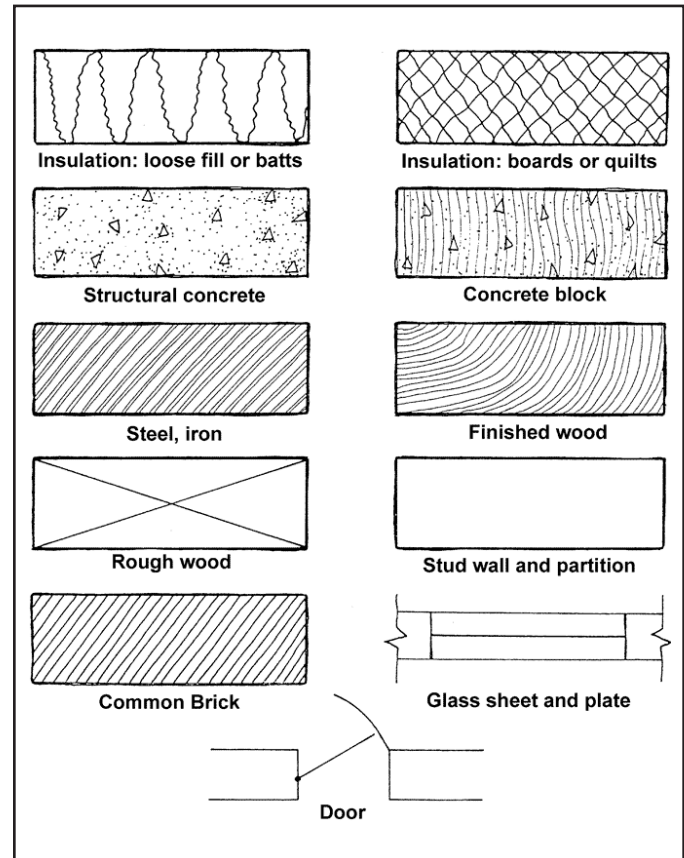
Standardized symbols are used to represent the following:

- Show the proper scale and location of objects, such as doors and windows
- Show the location of fixtures, such as electrical and plumbing
- Indicate the type or grade of the materials that objects are made of, such as wood, steel, brick, or concrete

Preparing Drawings and Adding Dimensions

The basic steps for making a working drawing are as follows:

Figure 2.2 – Commonly Used Symbols in Working Drawings



1. Draw a border line along each side of the paper. A border line is a heavy, solid line that establishes the work area for the drawing and gives the drawing a finished look. This line is commonly drawn 1/2 in. from the edge of the paper.
2. Add a title block to the drawing. The title block contains important information about the whole drawing and is the part of the drawing that should be read first. Information in the title block typically includes:
 - Who made the drawing
 - When the drawing was made
 - Name of the drawing
 - Scale of the drawing
3. Decide on the scale of the drawing, if it is to be drawn to scale. Be sure to leave enough room to add dimensions on each view.

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- Decide on the views that will be drawn and where they will be positioned. The number of views drawn should be the minimum number required to present the essential information. For most objects, three views are adequate. Views are generally placed on the drawing as follows: front view at lower left-hand corner, top view directly above the front view, and end view to the right of the front view. Each view can show dimensions for different edges of the object, which helps to keep the drawing uncluttered and easy to read.
- Complete the working drawing using a sharp lead pencil and measurement tools.
- Add dimensions and any construction notes using dimension, extension, and leader lines. See Figure 2.3. The dimensions indicate the length, height, width, and thickness of all the parts of the object. The dimensions must be accurate and exact. The builder uses the dimensions to prepare a bill of materials and as a guide for measurements made during the construction process. See Figure 2.4 for a sample drawing.

Figure 2.3 – Techniques for Showing Dimensions in a Working Drawing

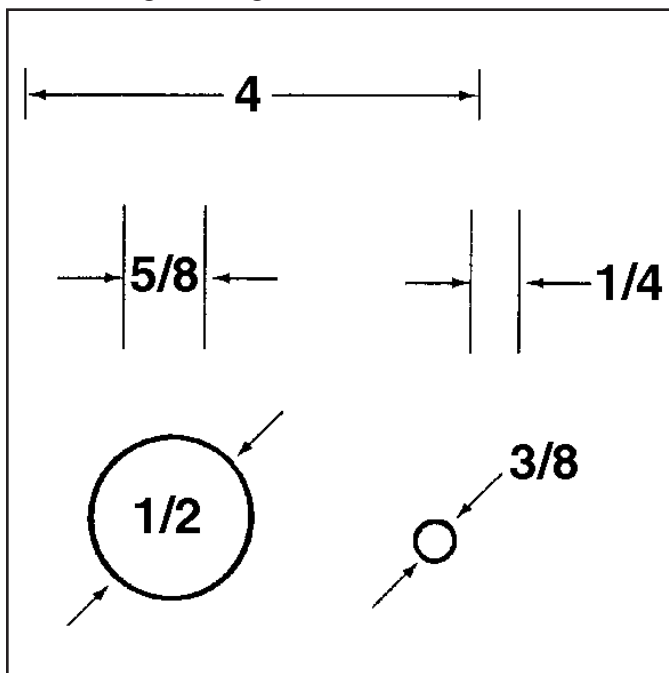
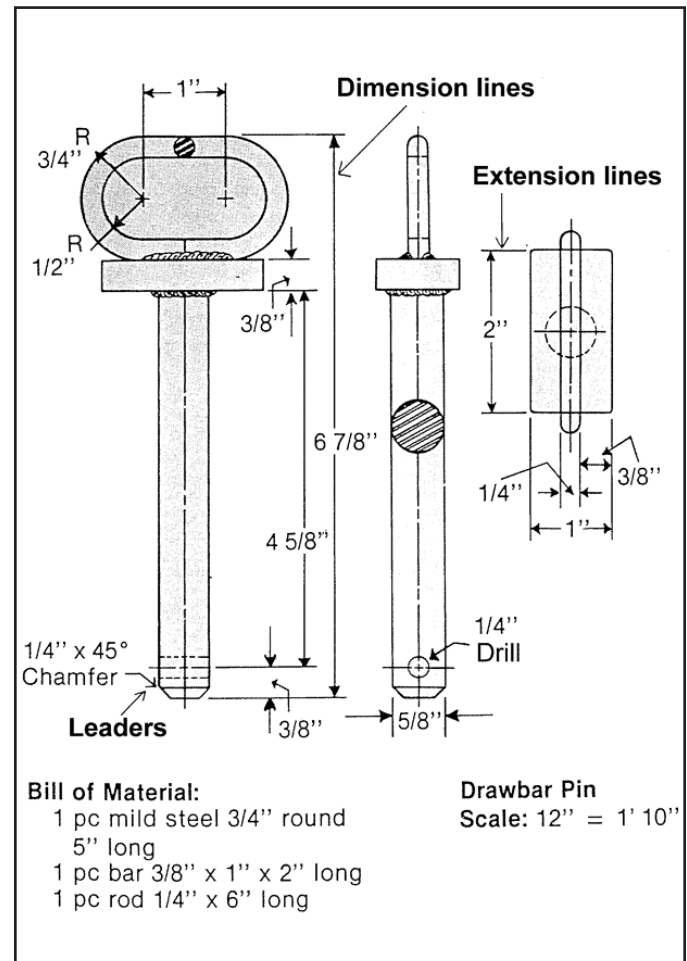


Figure 2.4 – Example of Dimensions in a Working Drawing of a Drawbar Pin



Summary

A working drawing of an object includes all the dimensions and specifications necessary to build the object. A working drawing should be used for every building project because a drawing promotes efficiency, consistency, and accuracy. Some drawings are drawn to scale, which means the object is drawn full size or in proportion to full size. Features of a working drawing include different views to show all parts of the object, a title block that provides information about the whole drawing, and lines and symbols to communicate information that would be difficult to draw. Another important feature is the dimensions. The dimensions indicate length, height, width, and thickness of all parts of the object and must be exact and accurate.

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Credits

Agricultural Mechanics Unit for Agricultural Science II. University of Missouri-Columbia: Instructional Materials Laboratory, June 1983.

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