
Industrial Drawings

INTRODUCTION

One of the oldest forms of communication between people is the use of a drawing. A *drawing* is a means of providing information about the size, shape, or location of an object. It is a graphic representation that is used to transfer this information from one person to another.

Drawings play a major role in modern industry. They are used as a highly specialized language among engineers, designers, and others in the technical field. These industrial drawings are known by many names. They are called mechanical drawings, engineering drawings, technical drawings, or working drawings. Whatever the term, their intent remains the same. They provide enough detailed information so that the object may be constructed.

Engineers, designers, and drafting technicians commonly produce drawings using computer-aided design and drafting equipment (CAD). The application of computer technology has led to greater efficiency in drawing production and duplication. CAD systems have rapidly replaced the use of mechanical tools to produce original drawings.

COMPUTER-AIDED DESIGN AND DRAFTING

Computer-aided design or *computer-aided drafting* (CAD) systems are capable of automating many repetitive, time-consuming drawing tasks. The present technology enables the drafter to produce or reproduce drawings to any given size or view. Three-dimensional qualities may also be given to a part, thus reducing the confusion about the true size and shape of an object. Figure 1.1 shows a typical drawing produced with the help of a computer-aided design system.

CAD systems usually consist of three basic components: (1) hardware, (2) software, and (3) operators or users. The hardware includes a processor, a display system, keyboard, plotter, and digitizer often called a “mouse.” Software includes the programs required to perform the design or drafting function. Software packages are available in many forms, depending upon the requirements of the user.

The CAD processor is actually the computer or “brains” of the system. The keyboard, which looks very much like a typewriter, is used to place commands into the processor. The commands or input are then displayed graphically on the system display screen. This screen is commonly a cathode ray tube (CRT). The digitizer, or mouse, is used to create graphic images for display on the CRT. The plotter is a printer that produces hard copies of a design in print form.

Industrial drawings are usually produced on a paper material called vellum or on a polyester film material known as Mylar. Mylar is a clear polyester sheet that has a matte finish on one or both sides. The matting provides a dull, granular drawing surface well-suited for pencil or ink lines. Mylar is preferred over vellum in some applications because it resists bending, cracking, and tearing. A completed industrial drawing is known as an original or master drawing.

BLUEPRINTS

Because original drawings are delicate, they seldom leave the drafting room. They are carefully handled and filed in a master file of originals. When a copy of an original is required, a print is made.

The term used for the process of reproducing an original is known as *blueprinting*. The earliest form of blueprinting produced white line, blue background reproductions. This early process, which was developed in England more than 100 years ago, has since changed. Modern reproductions produce a dark line, white background duplication simply called a *print*. However, the term blueprint is still widely used in industry and has been included in the title of this text.

INTERPRETING INDUSTRIAL DRAWINGS

Industrial drawings and prints are made for the purpose of communication. They are a form of nonverbal communication between a designer and builder of a product. Industrial drawings are referred to as a universal language. It is a language that can be interpreted and understood regardless of country. Also, drawings and prints become part of a contract between parties buying and selling manufactured parts.

A picture or photograph of an object would show how the object appears. However, it would not show the exact size, shape, and location of the various parts of the object.

Industrial drawings describe size and shape and give other information needed to construct the object. This information is presented in the form of special lines, views, dimensions, notes, and symbols. The interpretation of these elements is called *print reading*.

THE REPRODUCTION PROCESSES

There are several methods available for reproducing drawings.

Chemical Process

The ammonia process is a common method of print reproduction. To produce a copy, the original is placed on top of a light-sensitive print paper. Both the original and the print are fed into the diazo machine and exposed to a strong ultraviolet light. As the light passes through the thin original, it burns off all sensitized areas not shadowed by lines. The print paper is then exposed to an ammonia atmosphere. The ammonia develops all sensitized areas left on the print paper. The result is a dark line reproduction on a light background.

Silver Process

The silver process is actually a photographic method of reproduction. This process is often referred to as microfilming or photocopying.

This method is rapidly gaining popularity in industry due to storage and security reasons. The most common procedure followed is to photograph an original drawing to gain a microfilm negative. The negative is then placed on an aperture card and labeled with a print number. Duplicates of the microfilm are produced with the aid of a microfilm printer using sensitized photographic materials. Enlarged or reduced prints can be produced using this process.

The aperture cards containing the microfilm are very small. Therefore, cataloging and filing take very little room for storage. They are also much easier to handle than the delicate originals, which must be kept in large files.

Microfilming is often done for security reasons. As many as 200 prints may be placed on one roll of microfilm. They may then be placed in a vault or other secure area.

Electrostatic Process

The electrostatic process has gained in popularity for industrial drawing reproduction. Although once limited to reproducing documents and small drawings, new machines have been developed that allow large drawing duplication. The electrostatic process, commonly known as xerography, uses a zinc-coated paper that is given an electrostatic charge. The zinc coating is sensitive to ultraviolet light when exposed. Areas shadowed by lines on the original produce a dark line copy.

CAD Process

One advantage of a CAD system is the ability to file and store original drawings electronically. Stored drawings can be accessed and reproduced whenever a revision is required or additional copies are needed. To reproduce a CAD drawing, a message must be sent from the CAD processor to an output device called a printer or printer/plotter, Figure 1.2.

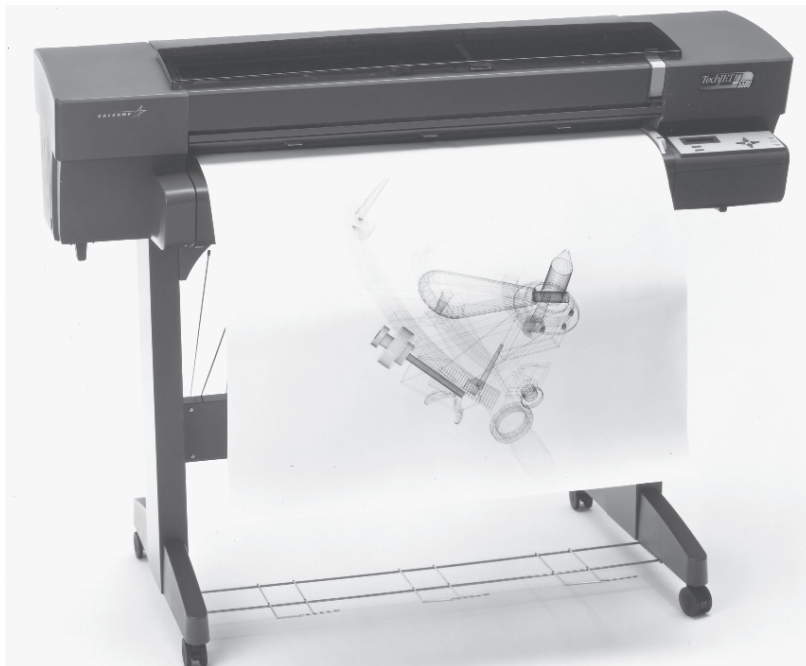


FIGURE 1.2 ■ CAD printer/plotter

ASSIGNMENT: REVIEW QUESTIONS

1. List two other names commonly given industrial drawings.
 - a. _____
 - b. _____
2. Industrial drawings should provide enough information so that the object can be _____.
3. The paper material on which original drawings are produced is called _____.
4. A completed industrial drawing is known as a master drawing or _____.
5. Master drawings
 - a. are provided to the machine builder.
 - b. seldom leave the drafting room.
 - c. are developed by the master drafter.
 - d. are always drawn on vellum.
6. What is the term used for reproducing an industrial drawing?

7. Industrial drawings are often referred to as _____ language.
8. Industrial drawings are a form of communication that is
 - a. verbal.
 - b. nonverbal.
9. Why is a photograph not used to describe an object?

10. The light the print paper is exposed to in the diazo process is
 - a. sunlight.
 - b. infrared light.
 - c. fluorescent light.
 - d. ultraviolet light.
11. The silver process is
 - a. seldom used.
 - b. a photographic process.
 - c. an ammonia process.
 - d. a heat process.
12. List two advantages of microfilming.
 - a. _____
 - b. _____
13. Aperture cards
 - a. are small.
 - b. contain print information.
 - c. are used for filing.
 - d. all of the above.
 - e. none of the above.

14. The heat process uses a chemically coated paper that is sensitive to
- a. infrared light.
 - b. heat.
 - c. ammonia.
 - d. ultraviolet light.
15. The electrostatic process uses paper that is sensitive to
- a. chemicals.
 - b. ammonia.
 - c. heat.
 - d. light.
16. The electrostatic process uses a paper coated with
- a. carbon.
 - b. lead.
 - c. iron.
 - d. zinc.
17. List three components of a CAD system.
- a. _____
 - b. _____
 - c. _____
18. The display screen used with a CAD system is called a _____.
19. What is one advantage a CAD system has over conventional drawing methods?
