# Dimensioning Systems and Practices

DIMENSIONING is an extremely important element to technical drawings. It is really the only accurate way the fabricator or builder knows exactly what size to make things. There are several different ways in which features are dimensioned. This usually depends on what the information or drawing is about. There are also certain standards used to dimension various geometries and shapes. It is important to follow these for accurate communication.

## Objective:

Identify and describe dimensioning systems and techniques.

## Key Terms:

aligned dimensioning
arrowless dimensioning
chamfer
chart drawing
controlled radius
ordinate dimensioning
tabular dimensioning
taper
unidirectional dimensioning

## Understanding Dimensioning Systems and Techniques

There are five dimensioning systems: aligned, arrowless, chart drawings, tabular, and unidirectional. They are used for a variety of reasons in different situations. In addition, there are special conditioning techniques used for angles, arcs, chamfers, conical shapes, and hexagons to ensure clarity for proper communication.

## ALINGNED DIMENSIONING

**Aligned dimensioning** requires that all dimension text (i.e., numerals, figures, and notes) be aligned with the dimension lines. This allows the text to be read from the bottom for horizontal dimensions and from the right side for vertical dimensions. Aligned dimensioning is typically used in architectural and structural drafting.

## ARROWLESS DIMENSIONING

**Arrowless dimensioning**, also known as **ordinate dimensioning**, is a system in which features are identified with letters and are keyed to a table. Location dimensions are established with extension lines as coordinates from determined data. Arrowless dimensioning is often referred to as dimensioning without dimension lines.

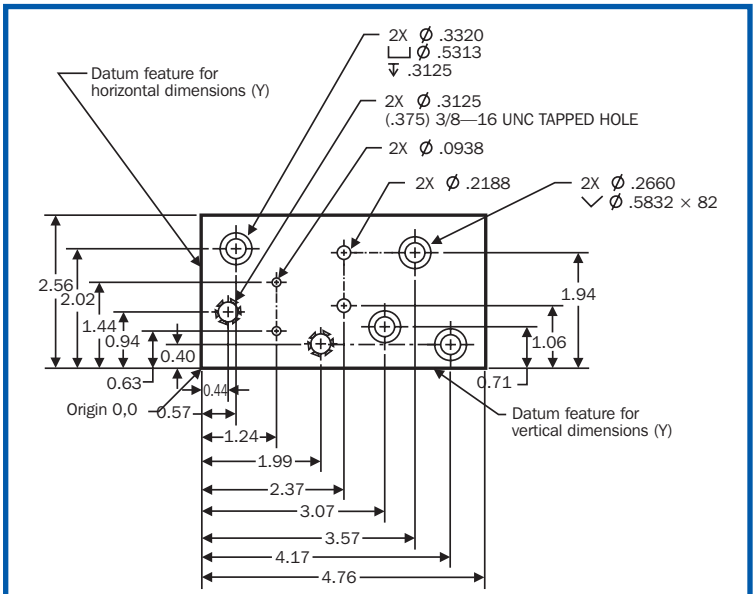


**FIGURE 1. This is an example of ordinate dimensioning. This method may be used for complex parts with many holes.**

## CHART DRAWINGS

A **chart drawing** is used when a particular part has one or more dimensions that change depending on the specific application. The dimension that changes is usually labeled on a drawing with a letter in the place of the dimension. The letter can then be found on a chart where the changing values are identified. Chart drawings are often used in vendor or specification catalogs for alternate part identification.

## TABULAR DIMENSIONING

**Tabular dimensioning** is a system in which the size and location dimensions from data or coordinates (i.e., x, y, and z axes) are found in a table identifying features on a drawing. Tabular dimensions and arrowless dimensions are similar in that both methods involve letters that identify features in corresponding tables.

## UNIDIRECTIONAL DIMENSIONING

**Unidirectional dimensioning** is dimensioning that requires that all dimension text be lettered horizontally and read from the bottom. Unidirectional dimensioning is typically used in mechanical drafting.

## ANGLES

Angular surfaces may be dimensioned as angles in degrees, as coordinates, or as a flat **taper** (the slope of a plane surface). Angles are calibrated in degrees (°). There are 360 degrees in a circle. Each degree consists of 60 minutes (‘). Each minute contains 60 seconds (“). So 1° equals 60’ and 1’ equals 60".

## ARCS

Arcs should be dimensioned with leaders and radius dimensions in the views in which they are shown as arcs. The leader may extend from the center to the arc, or it may point to the arc. The radius dimension should be noted with the letter “R.” Arcs may be dimensioned with or without their centers located, depending on the situation. When an arc is located on an inclined plane and the true representation is not shown, the note “True R” should be used to indicate the actual radius.

The letters “CR” should be used to indicate **controlled radius**, meaning the limits of the radius tolerance zone are tangent to the adjacent surface; there are no reversals in the contour. The “CR” control is more restrictive than the “R” radius symbol. The “R” symbol allows for reversals in the contour of the radius. The letters “SR” should precede the numerical value to indicate a spherical radius. These designations are usually used in technical machine part drawings.

## CHAMFERS, HEXAGONS, AND CONICAL SHAPES

A **chamfer** is a beveled or sloping edge used to relieve a sharp corner. Chamfers measuring 45 degrees should be dimensioned with a note because both sides of a 45-degree angle are equal. Other chamfers require an angle dimension and a size dimension or two side dimensions.

Hexagons and other polygons should be dimensioned across the flats in the views in which the true shape is shown. A length dimension should be provided in the adjacent view.Conical shapes should be dimensioned in the view in which the cone appears as a triangle. Depending on the applica-

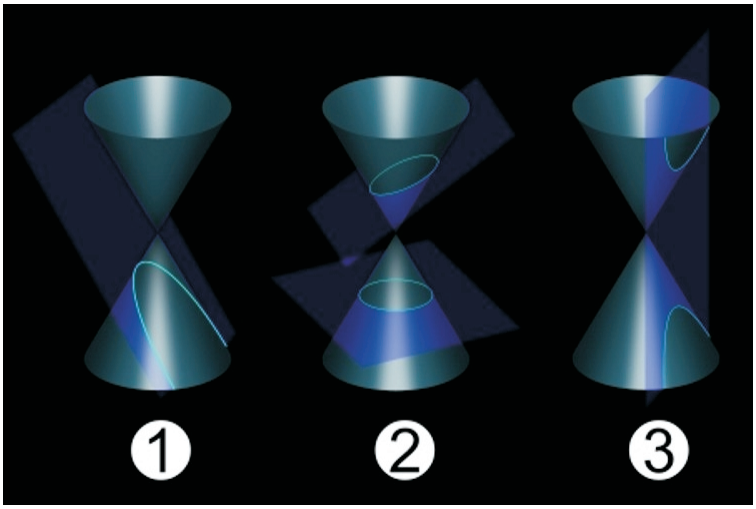


**FIGURE 2. As you can see in this image, cutting a section through a cone at different angles will produce many different shapes. To give accurate dimensioning information, it is important to cut the cone down the center so it appears as a triangle.**

## FURTHER EXPLORATION...

### ONLINE CONNECTION: Dimension and Orthographic Drawing

There are different techniques and strategies for dimensioning. The information being communicated is critical for the production or construction of the object. Understanding the basic process should be a foundation in your education. To see this process explained thoroughly, visit the following link:

http://en.eureka.ntic.org/display_lo.php?format=HTML&lom_id=8078

tion, you will need to dimension the overall height, the actual length of the triangle sides, or both.

## Summary:

There are five dimensioning systems: aligned, arrowless, chart drawings, tabular, and unidirectional. Some align and display the dimensional information right along the object's features; others may use keyed letters and reference tables.

Special dimensioning techniques are used for angles, arcs, chamfers, conical shapes, and hexagons. Angled surfaces may use several different dimensioning notations. Arcs should be dimensioned with leaders and should give the radius dimensions. Other shapes and forms require the full or true view to be shown for accurate dimensioning.

## Checking Your Knowledge:

1. What are three dimensioning types?
2. In tabular dimensioning, where are the dimensions found?
3. What is a taper?
4. What does True R indicate?
5. What is a chamfer?

## Expanding Your Knowledge:

There are different conventions and techniques for dimensioning that are usually specific to the function of the feature being dimensioned. A great way to learn is to actually see drawings with full sets of dimensions. You can plan a visit to a local engineering or architectural office, go through different drawings, and ask questions. Be prepared beforehand.

## Web Links:

**Drawing Conventions**

http://www.design-technology.info/IndProd/page4.htm

**Good Dimensioning Practices**

http://feh.eng.ohio-state.edu/Lectures/191au04/10-25%20Dimensioning%20Review.ppt

**Drawing Basics**

http://www.engineering.sdsu.edu/~johnston/drawing_basics.html

**Dimensioning Fundamentals**

http://www.maelabs.ucsd.edu/mae_guides/cad/dimensioning/dimensioning_fundementals.htm