Understanding Civil Drawings

Concepts
Civil drawings depict areas of land—a housing subdivision, for example, or a roadway system. A civil drawing may depict a plat—a map, drawn to scale, showing the divisions of a piece of land.

- Civil drafting requires a different approach to the Cartesian coordinate system.
- Civil drawings refer to bearings that indicate the direction of a line, and courses that indicate a bearing and a distance.
- Any drafting project that involves large distances requires additional resolution for angular measurements.
  - A degree is divided into 60 units called minutes, represented with a single quote (').
  - A minute is divided into 60 units called seconds, represented with a double-quote ("").
  - If you are entering an angle in the Command window, type d. For example if you enter 15d38′45″, AutoCAD interprets the d as degrees.
  - If you are entering angles in the Mtext editor, enter %%d, or click on the @ (Symbol) button and choose Degrees from the list for a degree symbol.

![Figure 1. Distance versus angle](image)

- In Figure 1 above, you can easily see that, over a distance of 500 miles, a 1-degree error can mean the difference between success and disaster. The accepted field tolerance is 1/10,000, or one foot of error in 10,000 feet of measurement.

Working with civil coordinates
- In land measurements, civil engineers refer to cardinal directions (North, South, East, and West), with North/South as the reference line (see Figure 2).
- They divide a 360-degree circle into four quadrants, labeled NE, SE, SW, and NW.
- They label all angles between 0° and 90°.
- They include the quadrant in angular measurements. For example, N54°E is measured 54 degrees from the North end of the reference line toward the East, which places it in the NE quadrant.

![Figure 2. Civil coordinate system](image)
Courses and Bearings

- Civil drawings represent a direction as a bearing, and a course as a bearing and a distance. A course is similar to a polar coordinate, but includes an indication of the quadrant. Angles may include minutes and seconds in addition to degrees.
- Remember that polar coordinates are comprised of a distance and an angle; for example, to draw a line 5 units long at a 45-degree angle, you enter @5<45°.
- An example of a course is @131.35<S34d15'E (see Figure 3). This represents an angle 34 degrees 15 minutes in the SE quadrant. Notice that the angle is nested between the two letters that indicate the quadrant.
- You may want to turn off Dynamic Input before you enter bearings. Click on the button labeled DYN in the status bar at the bottom of your drawing window (see Figure 4).

Working with Surveyor's Units
To correctly display properties of bearings, first display the Drawing Units dialog box (see Figure 5).

- Set Units to Decimal.
- Set Precision to the desired value.
- Set the Angle Type to Surveyor's Units.
- Set the Angle Precision to the desired precision.
- Set the Insertion scale to Inches. This setting controls the unit of measurement for objects that are inserted into the current drawing. An object created with different units is scaled according to this setting when inserted into the current drawing.
Representing Curves

- Civil drawings include detailed information for each curve in a drawing.
- A curve can indicate a curb at an intersection, a cul-de-sac, or a bend in a road.
- An arc represents a curve in a civil drawing.
- Each curve is labeled with a unique identifier (for example, C1) that refers to an entry in a curve table. A *curve table* provides measurements for each curve in the drawing.
- A curve table includes the data shown in Figure 6 below. For information about creating AutoCAD tables, see *Working with Tables* later in this unit.

  - **R (Radius)** The straight-line distance from the center point of the curve to the circumference of the curve (see items labeled 1 in Figure 6)
  - **I (Intersection angle)** The angle formed by the intersection of the extended lines from which the curve is cut (see item 2 in Figure 6)
  - **A (Arc)** The length of the curve, i.e., the distance along the perimeter of the curve (see item 6 in Figure 6)
  - **C (Chord)** The straight-line distance from the start point of the curve to the end point of the curve (see item 4 in Figure 6)
  - **Bearing** The angle of the chord (see item 3 in Figure 6)

![Figure 6. Curve terminology](image_url)
Sample Curve Table

An example of a curve table appears in Figure 7 below.

<table>
<thead>
<tr>
<th>CURVE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>C1</td>
</tr>
<tr>
<td>C2</td>
</tr>
<tr>
<td>C3</td>
</tr>
<tr>
<td>C4</td>
</tr>
<tr>
<td>C5</td>
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<tr>
<td>C6</td>
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<td>C7</td>
</tr>
<tr>
<td>C8</td>
</tr>
<tr>
<td>C9</td>
</tr>
<tr>
<td>C10</td>
</tr>
<tr>
<td>C11</td>
</tr>
</tbody>
</table>

Figure 7. Sample Curve table

Representing Text

Civil drawings do not have stringent requirements for text. The following rules apply:
- All text used for the same purpose in the drawing must be the same height and font.
- All text must be at least 0.10" in height when plotted.

Representing Dimensions

Dimensions in civil drawings are different from either mechanical or architectural dimensions.
- Some dimensions do not include either dimension lines or extension lines. You can suppress these lines when you create a dimension style.
- Several different dimension styles may be required in the same drawing. You can create multiple dimension styles in the **Dimension Style Manager** dialog box.
- When surveyors record dimensions of buildings, they purposely omit one or more dimensions. A surveyor can be held legally responsible to correct an incorrect dimension. By forcing the drafter to calculate the missing dimensions, the surveying company is not liable if those calculations are wrong.

The North Arrow

- Civil drawings typically include an arrow indicating which direction is north.
- The north arrow is oriented so that it points toward the top of the plotted drawing.
- AutoCAD includes several north arrows that you can insert into a civil drawing. There are several in the Unit 3 folder in the Shared directory, or you can design your own. The North arrow in Figure 8 is from DesignCenter.

![Sample North Arrow](image)