

LESSON 3

LEARNING OBJECTIVES

After completing this lesson, you will be able to:

1. Create a Circle using 6 different methods.
2. Create Rectangles with Chamfers, Fillets, Width, and Rotation.
3. Set Grids and Increment Snap.
4. Draw using Layers.
5. Control Layers.
6. Create Layers.

Circle

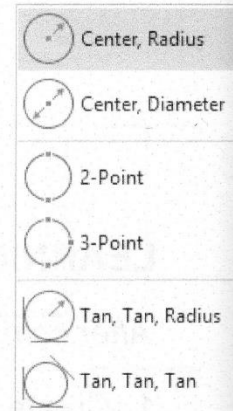
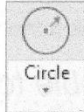
There are six options to create a circle.

The default option is “**Center, Radius**”. (Probably because that is the most common method of creating a circle.)

We will try the “**Center, Radius**” option first.

1. Start the **Circle** command by using one of the following:

Ribbon = Home Tab / Draw Panel /
or
Keyboard = C <Enter>



2. The following will appear on the Command Line:

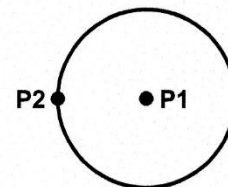
CIRCLE Specify center point for circle or [3P 2P Ttr (tan tan radius)]:

3. Locate the center point for the circle by moving the cursor to the desired location in the drawing area (**P1**) and then press the left mouse button.
4. Now move the cursor away from the center point and you should see a circle forming.
5. When the circle is the size desired (**P2**), press the left mouse button, or type the radius and then press **<Enter>**.

Note: To use one of the other methods described below, first select the Circle command, then select one of the other Circle options.

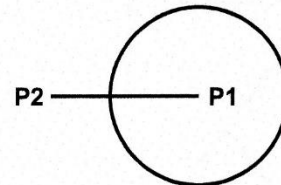
Center, Radius: (Default option)

1. Specify the center location (**P1**).
2. Specify the radius (**P2**). (Define the radius by moving the cursor or by typing the radius.)



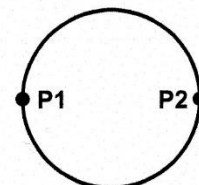
Center, Diameter:

1. Specify the center location (**P1**).
2. Specify the diameter (**P2**). (Define the diameter by moving the cursor or by typing the diameter.)



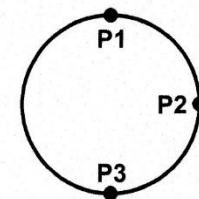
2-Point:

1. Select the 2-Point option.
2. Specify the 2 points (**P1** and **P2**) that will determine the diameter.



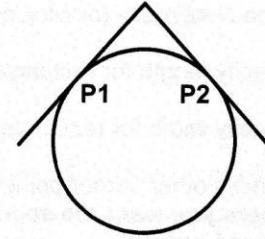
3-Point:

1. Select the 3-Point option.
2. Specify the 3 points (**P1**, **P2**, and **P3**) on the circumference. The circle will pass through all three points.

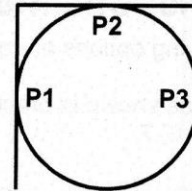


Tan, Tan, Radius:

1. Select the Tan, Tan, Radius option.
2. Select two objects (**P1** and **P2**) for the circle to be tangent to by placing the cursor on each of the objects and pressing the left mouse button.
3. Specify the radius.

**Tan, Tan, Tan:**

1. Select the Tan, Tan, Tan option.
2. Select three objects (**P1**, **P2**, and **P3**) for the circle to be tangent to by placing the cursor on each of the objects and pressing the left mouse button.
(AutoCAD will calculate the diameter automatically.)



Rectangle

A rectangle is a closed rectangular shape. It is one object not four lines.

You can specify the length, width, area, and rotation options.

You can also control the type of corners on the rectangle—fillet, chamfer, or square—and the width of the line.

First, let's start with a simple rectangle using the cursor to select the corners.

1. Start the **Rectangle** command by using one of the following:

Ribbon = Home Tab / Draw Panel /



or

Keyboard = REC <Enter>

2. The following will appear on the Command Line:

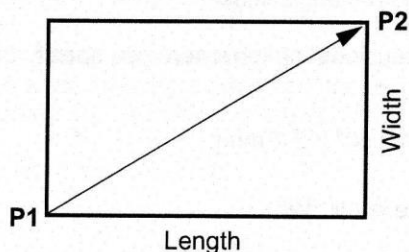
RECTANG Specify first corner point or [Chamfer Elevation Fillet Thickness Width]:

3. Specify the location of the first corner by moving the cursor to a location (**P1**) and then press the left mouse button.

4. The following will appear on the Command Line:

RECTANG Specify other corner point or [Area Dimensions Rotation]:

5. Specify the location of the diagonal corner (**P2**) by moving the cursor diagonally away from the first corner (**P1**) and then pressing the left mouse button.



If you know the dimensions for the length and width of the rectangle, refer to the next page for an alternative to Step 5.

5. Type **D <Enter>** (or click on the blue letter “D”).

Specify length for rectangles <0.000>: **Type the desired length and then press <Enter>**.

Specify width for rectangles <0.000>: **Type the desired width and then press <Enter>**.

Specify other corner point or [Area Dimensions Rotation]: **Move the cursor up, down, right or left to specify where you want the second corner relative to the first corner and then press <Enter> or press the left mouse button.**

Options: Chamfer, Fillet, and Width

The following options are only available before you place the first corner of the rectangle.

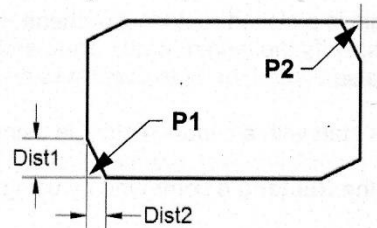
Note: Sizes shown in brackets [...] are for metric users. Enter the numbers without the brackets. **Example:** [12.7] just enter 12.7

Chamfer

A chamfer is an angled corner. The Chamfer option automatically draws all 4 corners with chamfers simultaneously and all the same size. You must specify the distance for each side of the corner as distance 1 and distance 2.

Example: Rectangle with Dist1 = 0.50" [12.7 mm] and Dist2 = 0.25" [6.35 mm].

1. Select the Rectangle command.
2. Type **C <Enter>** (or click on the blue letter “C”).
3. Enter **0.50 [12.7]** for the first distance.
4. Enter **0.25 [6.35]** for the second distance.
5. Place the first corner (**P1**).
6. Place the diagonal corner (**P2**).

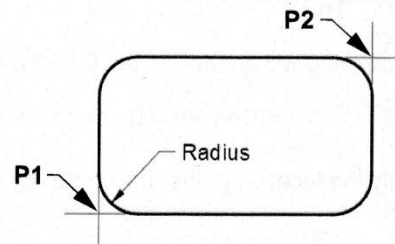


Fillet

A fillet is a rounded corner. The Fillet option automatically draws all 4 corners with fillets (all the same size). You must specify the radius for the rounded corners.

Example: Rectangle with 0.50" [12.7 mm] radius corners.

1. Select the Rectangle command.
2. Type **F <Enter>** (or click on the blue letter “F”).
3. Enter **0.50 [12.7]** for the radius.
4. Place the first corner (**P1**).
5. Place the diagonal corner (**P2**).



Note: You must set Chamfer and Fillet back to “0” before defining the width. Unless you want fat lines and Chamfered or Filleted corners.

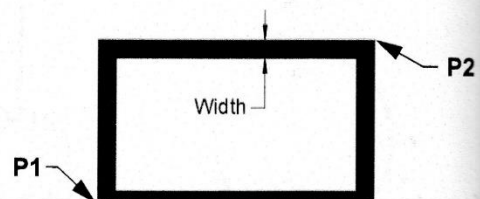
Width

The Width option defines the width of the rectangle lines.

Note: Do not confuse this with the “Dimensions” option where you specify the Length and Width of a rectangle. Width makes the lines appear fatter.

Example: Rectangle with a line width of 0.50" [12.7 mm].

1. Select the Rectangle command.
2. Type **W <Enter>** (or click on the blue letter “W”).
3. Enter **0.50 [12.7]** for the width.
4. Place the first corner (**P1**).
5. Place the diagonal corner (**P2**).



Options: Area and Rotation

Note: The following options are available after you place the first corner of the rectangle.

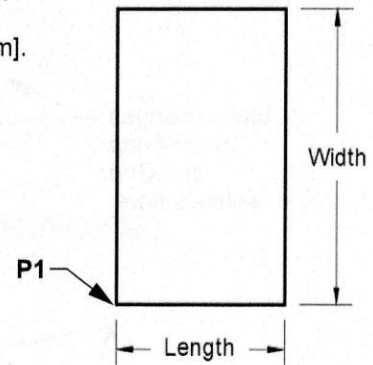
Area

Area creates a rectangle using the area and either a length or a width. If the Chamfer or Fillet option is active, the area includes the effect of the chamfers or fillets on the corners of the rectangle.

Example: Rectangle with an area of 6" [152.4 mm] and a length of 2" [50.8 mm].

1. Select the Rectangle command.
2. Place the first corner (**P1**).
3. Type **A <Enter>** (or click on the blue letter "A").
4. Enter **6 [152.4] <Enter>** for the area.
5. Select **L <Enter>** for the length (or click the blue letter "L").
6. Enter **2 [50.8] <Enter>** for the length.

(The width will be calculated automatically.)



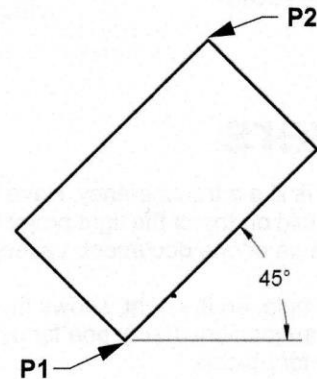
Rotation

You may select the desired rotation angle after you place the first corner and before you place the second corner. The basepoint (pivot point) is the first corner.

Note: All new rectangles within the drawing will also be rotated unless you reset the rotation to 0. This option will not affect rectangles already in the drawing.

Example: Rectangle with a rotation angle of 45 degrees.

1. Select the Rectangle command.
2. Place the first corner (**P1**).
3. Type **R <Enter>** (or click on the blue letter "R").
4. Enter **45 <Enter>**.
5. Place the diagonal corner (**P2**).



Grid and Increment Snap

Grid is the criss-cross lines in the drawing area. The grid is only a drawing aid to assist you in aligning objects and visualizing the distances between them. **The Grid will not plot.** (Refer to page 1-13.)

Increment Snap controls the movement of the cursor. If it is **off**, the cursor will move smoothly. If it is **on**, the cursor will jump in an **incremental** movement. (Refer to page 1-13.)

The **Drafting Settings** dialog box allows you to set **Increment Snap** and **Grid** spacing. You may change the Grid spacing and Increment Snap at anytime while creating a drawing. The settings are only drawing aids to help you visualize the size of the drawing and control the movement of the cursor.

1. Select **Drafting Settings** by using one of the following:

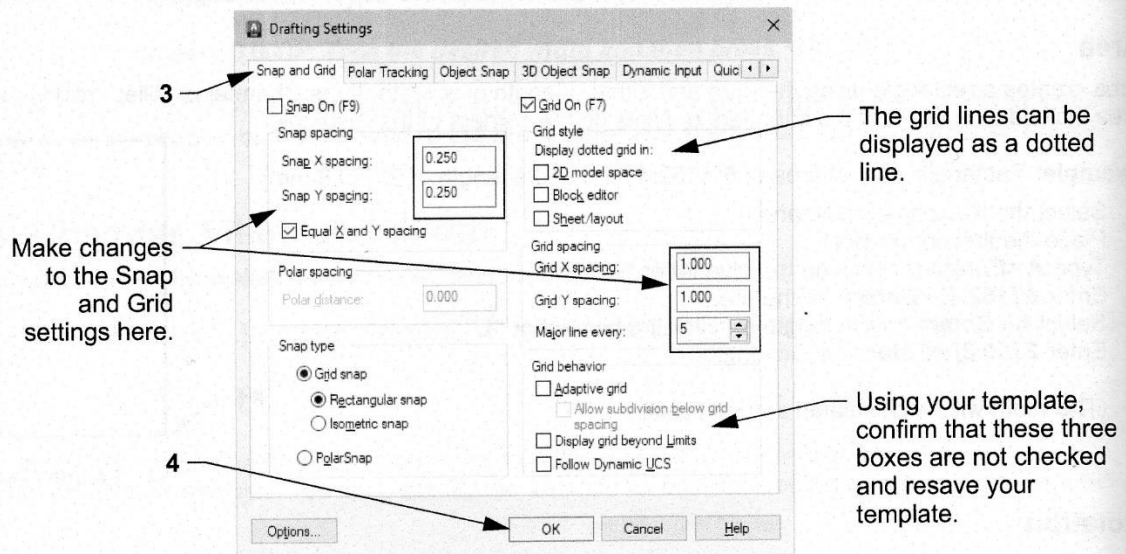
Keyboard = DS <Enter>

or

Status Bar = Right click on the Snap or Grid button and select Settings.

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- The dialog box shown below will appear showing inch or metric units depending on whether you selected an **inch** or **metric** template.



- Select the **"Snap and Grid"** Tab.

- Make your changes and select the **OK** button to save them. If you select the **Cancel** button, your changes will not be saved.

Layers

A **Layer** is like a transparency. Have you ever used an overhead light projector? Remember those transparencies that are laid on top of the light projector? You could stack multiple sheets, but the projected image would have the appearance of one document. Layers are basically the same. Multiple layers can be used within one drawing.

The example, on the right, shows three layers. One for annotations (text), one for dimensions, and one for objects.

How to use Layers

First you select the layer and then you draw the objects. Always select the layer first and then draw the objects.

It is good "drawing management" to draw related objects on the same layer. For example, in an architectural drawing, you would select the "Walls" layer and then draw the floor plan.

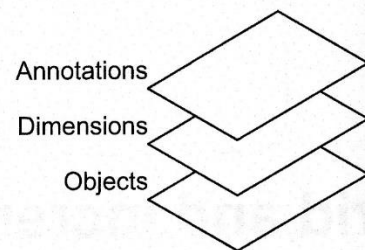
Then you would select the "Electrical" layer and draw the electrical objects.

Then you would select the "Plumbing" layer and draw the plumbing objects.

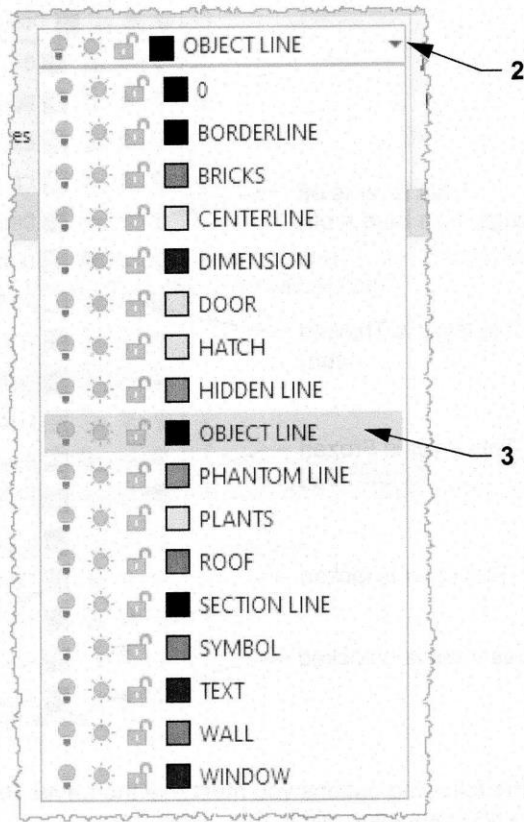
Each layer can then be controlled independently. If a layer is **Frozen**, it is **not visible**. When you **Thaw** the layer, it becomes **visible** again. (Refer to the following pages for detailed instructions on controlling layers.)

How to select a Layer

- Go to **Ribbon = Home Tab / Layers Panel**.
- Select the drop-down arrow ▼.
- Highlight the desired layer and press the left mouse button.



The selected layer becomes the **current** layer. All objects will be located on this layer until you select a different layer.



Controlling Layers

The following controls can be accessed using the Layer drop-down arrow ▼.



On or Off

If a layer is **on**, it is **visible**. If a layer is **off**, it is **not visible**. Only layers that are **on** can be **edited** or **plotted**.

Freeze or Thaw

Freeze and Thaw are very similar to **on** and **off**. A Frozen layer is **not visible** and a Thawed layer is **visible**. Only Thawed layers can be edited or plotted.

Additionally:

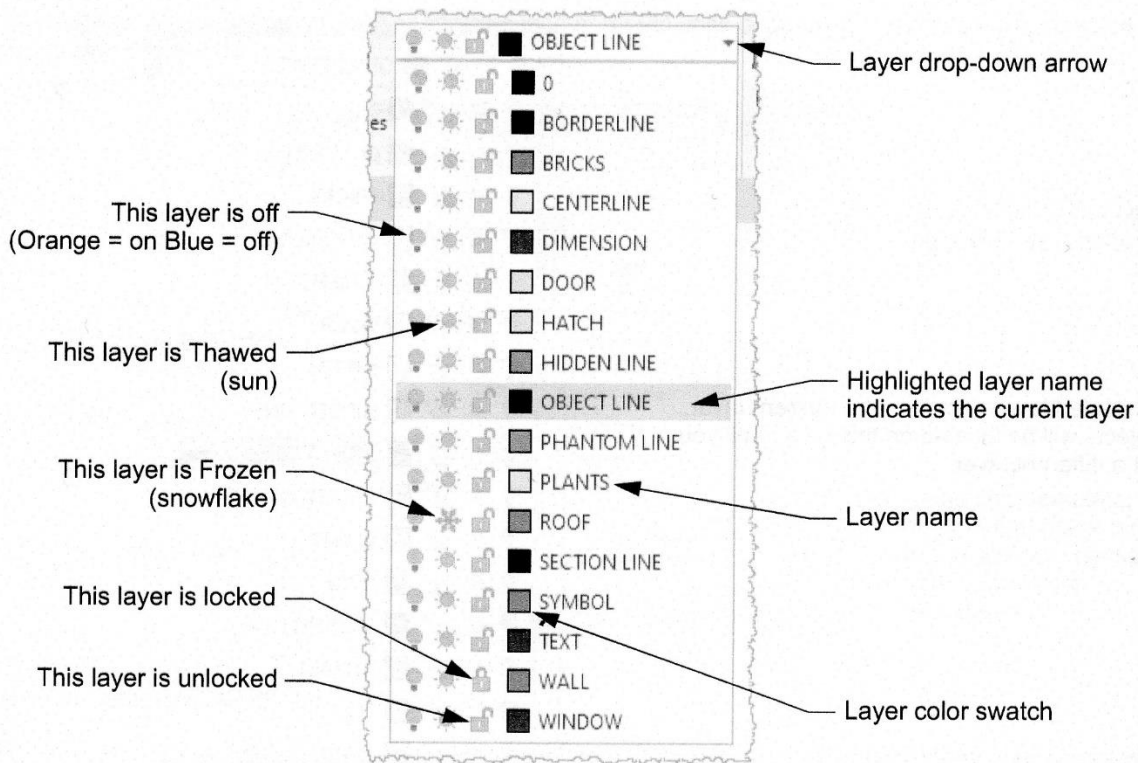
- Objects on a Frozen layer **cannot** be accidentally erased.
- When working with large and complex drawings, freezing saves time because Frozen layers are not **regenerated** when you zoom in and out.

Lock or Unlock

Locked layers are visible but **cannot be edited**. They are visible so they **will** be plotted.

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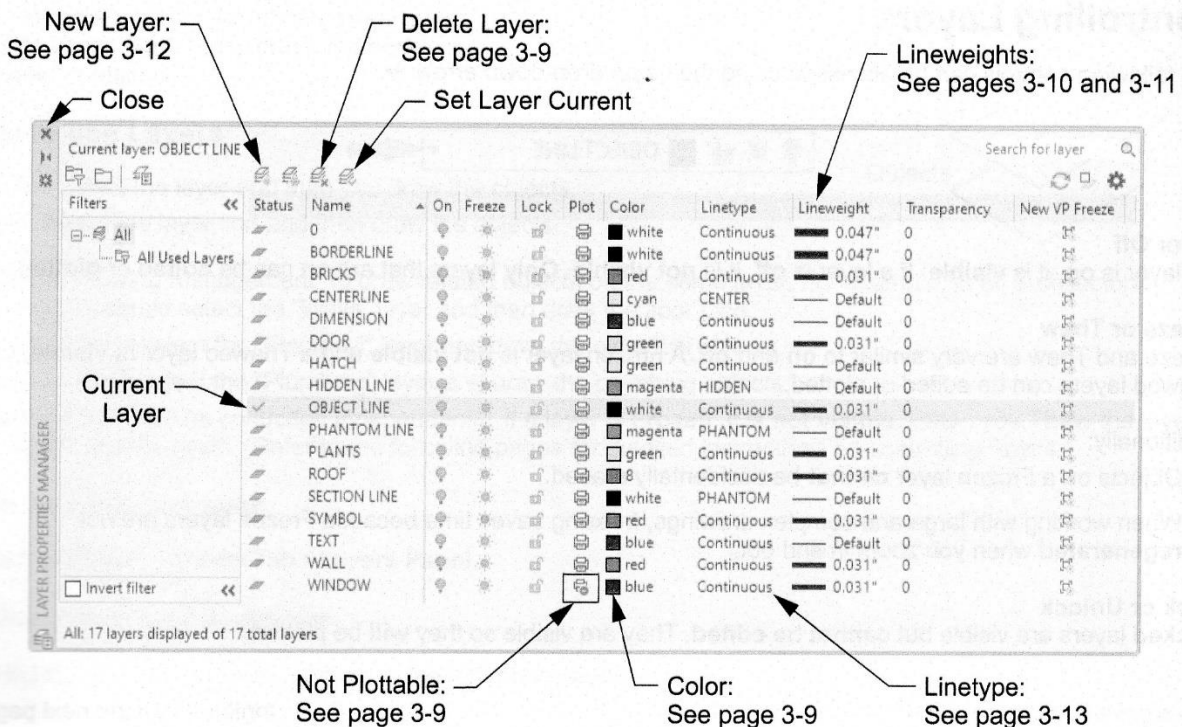
Layers



To access the following options you must use the **Layer Properties Manager**. You may also access the options listed on the previous page within this dialog box.

To open the **Layer Properties Manager** use one of the following.

Ribbon = Home Tab / Layers Panel /
or
Keyboard = LA <Enter>



How to delete an existing layer

1. Highlight the layer name to be deleted.
 2. Select the **Delete Layer** tool.
- or
1. Highlight the layer name to be deleted.
 2. Right click and select **Delete Layer**.

Plot or Not Plottable

This tool prevents a layer from plotting even though it is visible within the Drawing Area. A **Not Plottable** layer will not be displayed when using **Plot Preview**. If the Plot tool has a slash, the layer will not plot.

Layer Color

Color is not merely to make a pretty display on the screen. Layer colors can help define objects. For example, you may assign green for all doors. Then, at a glance, you could identify the door and the layer by its color.

Here are some additional things to consider when selecting the colors for your layers.

Consider how the colors will appear on the paper.
(Pastels do not display well on white paper.)

Consider how the colors will appear on the screen.
(Yellow appears well on a black background but not on white.)

How to change the color of a layer

1. Select the layer that you want to change.

2. Select the color swatch or name.

3. Select the color from the Index or primary color strip. (The color name or number will appear in the color box.)

4. Select the **OK** button.

5. The color selected will appear on the layer line.

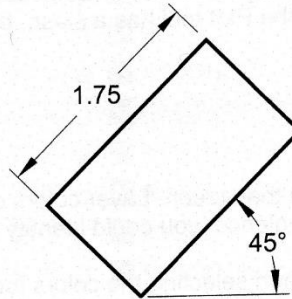
Filters	Status	Name	On	Freeze	Lock	Plot	Color
All		0	☑	☑	☑	☑	white
All Used Layers		BORDERLINE	☑	☑	☑	☑	white
		BRICKS	☑	☑	☑	☑	red
		CENTERLINE	☑	☑	☑	☑	cyan
		DIMENSION	☑	☑	☑	☑	blue

Lineweights

Lineweight refers to “how heavy or thin is the object line”.

It is “good drawing management” to establish a contrast in the lineweights of entities.

In the example below, the rectangle has a heavier lineweight than the dimensions. The contrast in lineweights makes it easier to distinguish between entities.



Lineweight Settings

Lineweights are plotted with the exact width of the lineweight assigned. But you may adjust how they are **displayed on the screen**. (Refer to Step 4 below.)

Important: Before assigning lineweights you should first select the **Units for Listing** and **Adjust Display Scale** as shown below.

1. Select the **Lineweight Settings** box using one of the following:

Keyboard = LW <Enter>

or

Status Bar = Right click on the Lineweight button and then click on Lineweight Settings.

Lineweight Settings...

3. Select **Display Lineweight** box.

2. Select **Inches or Millimeters**.

4. Click and drag to adjust the “**Displayed Scale**” of the lineweight. (**Note:** This will not affect the width when plotted, it is just for on-screen display.)

5. Select **OK** Button.

Note: These settings will be saved to the computer not the drawing, and will remain until you change them. You may have to shut down AutoCAD and then restart the program for the changes to take effect.

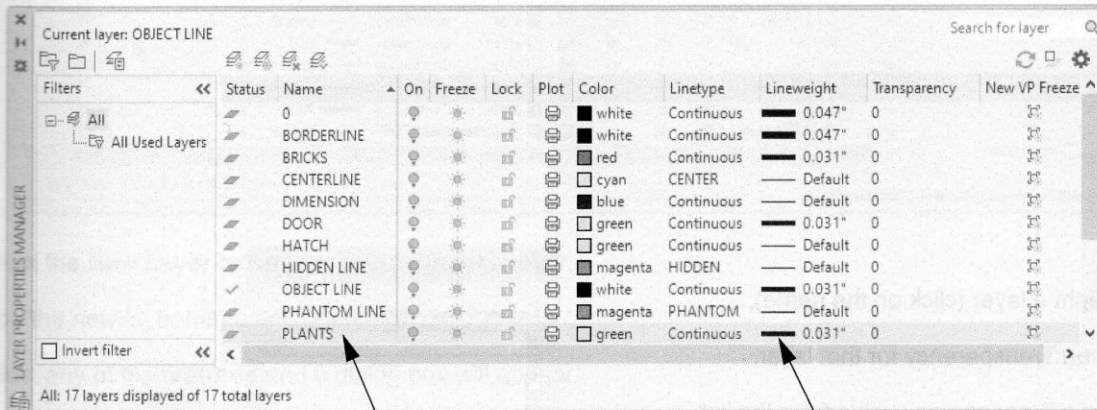
Assigning Lineweights

Note: Before assigning **Lineweights** to layers, make sure your **Lineweight settings (Units for Listing and Adjust Display Scale)** are correct. (See above.)

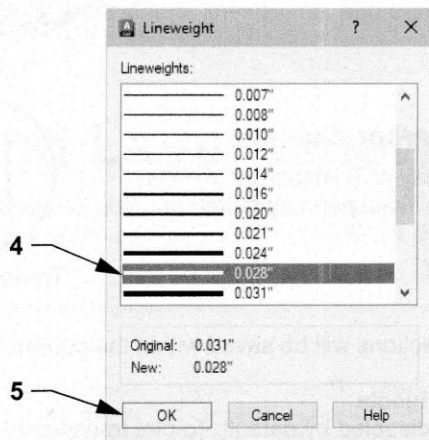
Assigning Lineweights to Layers

1. Select the **Layer Properties Manager** using one of the following:

Ribbon = Home Tab / Layers Panel /
 or
 Keyboard = LA <Enter>



2. Highlight a layer (click on the name).
3. Click on the Lineweight for that layer.
4. Scroll and select a Lineweight from the list.
5. Select the **OK** button.



Note: Lineweight selections will be saved within the **current** drawing and will not affect any other drawing. The images above show lineweight sizes for the **inch-helper.dwt**. Metric sizes will appear if you are using the **metric-helper.dwt**.

Transparency

Each layer may be assigned a transparency percentage from **0** to **90** percent. **0** would not be transparent at all and **90** would be **90** percent transparent.

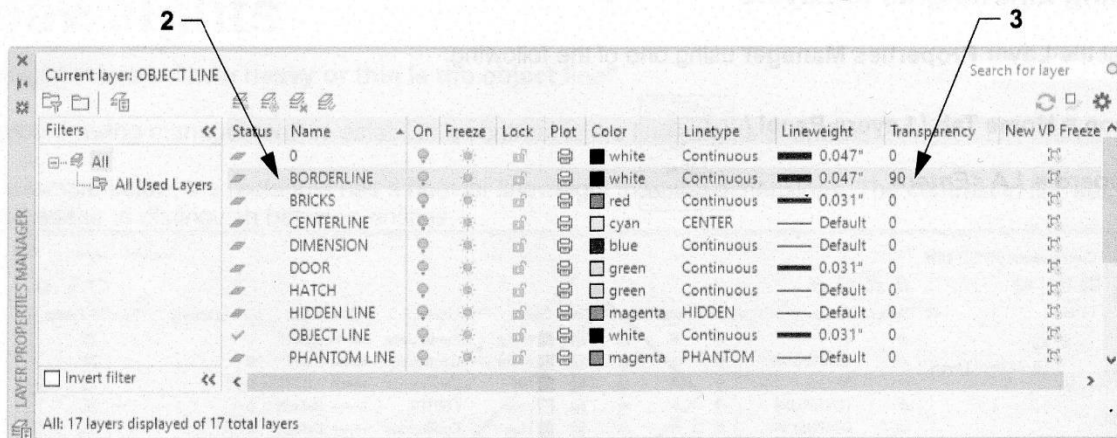
Assigning Transparency to Layers

1. Select the **Layer Properties Manager** using one of the following:

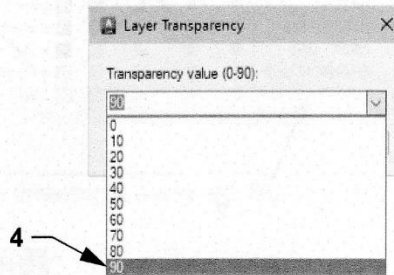
Ribbon = Home Tab / Layers Panel /
 or
 Keyboard = LA <Enter>



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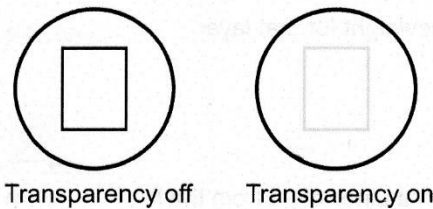


2. Highlight a layer (click on the name).
3. Click on Transparency for that layer.
4. Select a Transparency value from the list.
5. Select the **OK** button.



Controlling Transparent display

You may toggle the display of Transparent objects on or off by selecting the Transparency button on the Status Bar.



Note: Transparency selections will be saved within the current drawing and will not affect any other drawing.

Plotting Transparent Objects

Plotting transparency is disabled by default. To plot transparent objects, check the Plot transparency option in either the Plot dialog box or the Page Setup dialog box. This will be discussed in Lesson 26.

Creating New Layers

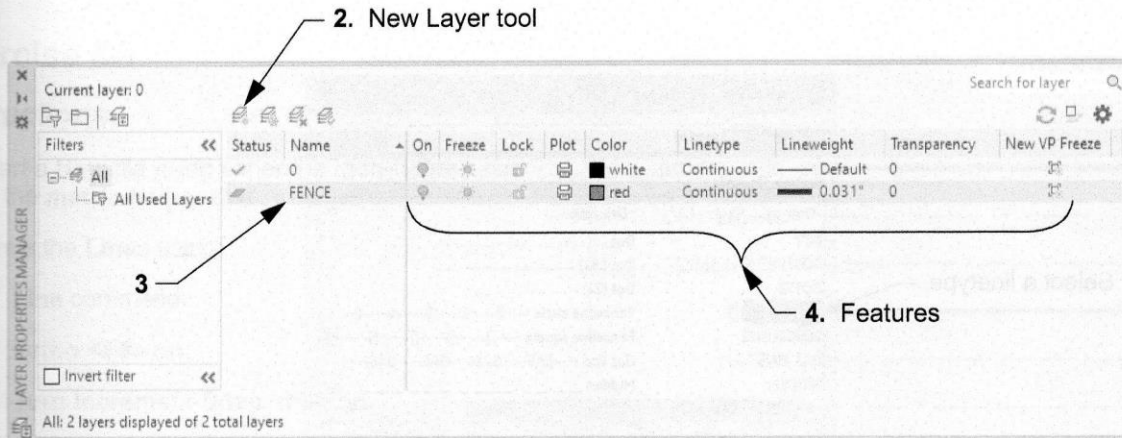
Using layers is an important part of managing and controlling your drawing. It is better to have too many layers than too few. You should draw like objects on the same layer. For example, place all doors on the “door” layer or Centerlines on the “Centerline” layer.

When you create a new layer, you will assign a **name**, **color**, **linetype**, **lineweight**, **transparency** and whether or not it should **plot**.

1. Select the **Layer Properties Manager** using one of the following:

Ribbon = Home Tab / Layers Panel /
or
Keyboard = LA <Enter>





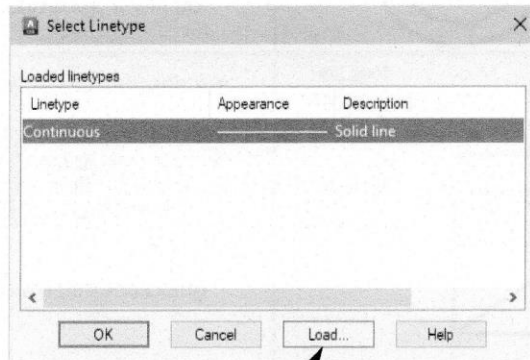
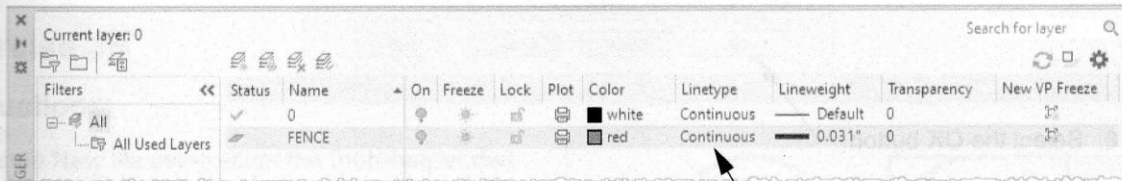
2. Select the **New Layer** tool and a new layer will appear.
3. Type the new layer name and press **<Enter>**.
4. Select any of the **features** and a dialog box will appear.

Features:

Refer to the previous pages for controlling and selecting layer colors, lineweights, and transparency.

Loading and Selecting Layer Linetypes

In an effort to conserve data within a drawing file, AutoCAD automatically loads only one linetype called "continuous". If you would like to use other **linetypes**, such as "DASHED" or "FENCELINE1", you must **Load** them into the drawing as follows:



2. Select the **Load...** button.

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