The Department of Construction Management and Civil Engineering Technology

CMCE-1110 Construction Drawings 1

Lecture Introduction to AutoCAD

What is AutoCAD?

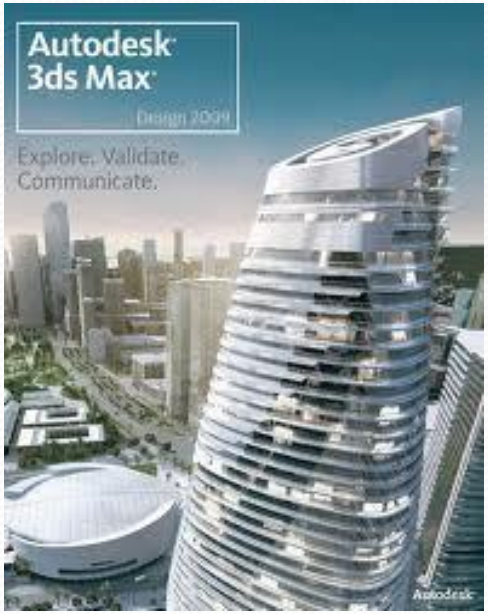
The term CAD (Computer Aided Design /Drafting) applies to a wide range of programs that allow the user to created drawings, plans, and designs electronically. AutoCAD is one such program and it main claim to fame is that it is relatively easy to use, it is very comprehensive in its ability to create 2D and some 3D drawings, and it is very popular. Seventy percent of the CAD users in the world use AutoCAD. Autodesk is the most popular drawing program Many student versions available for free online at students.autodesk.com

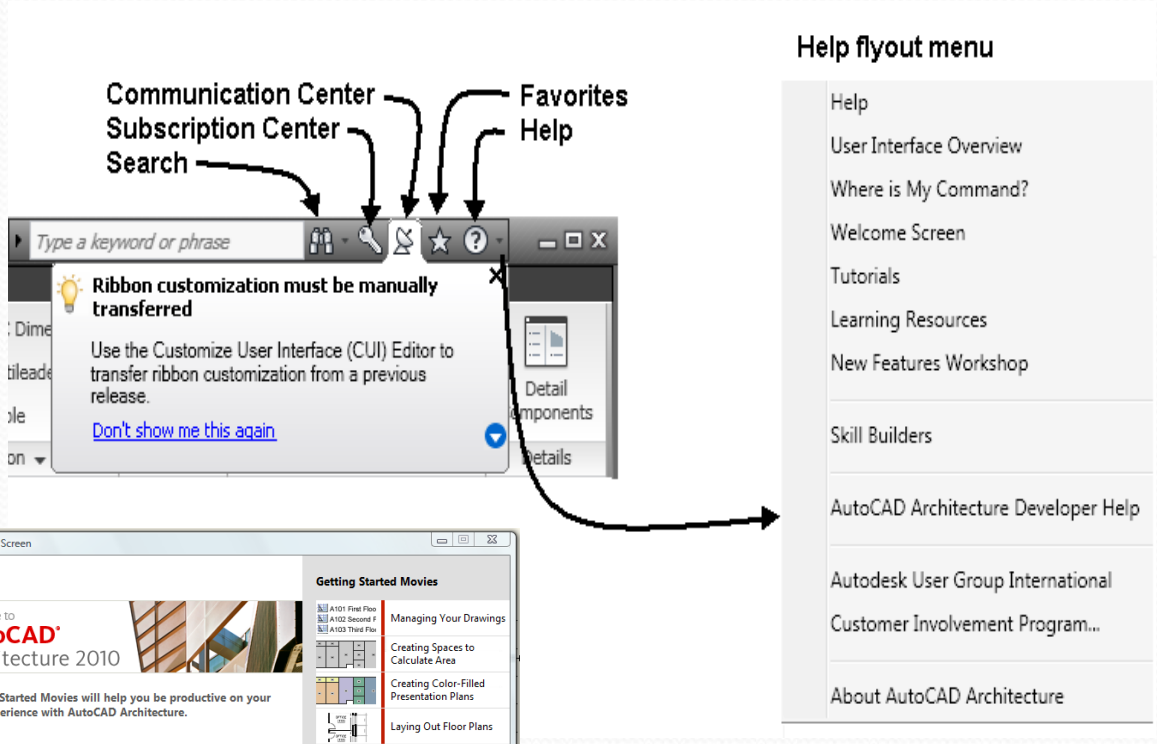
AutoCAD Capabilities:

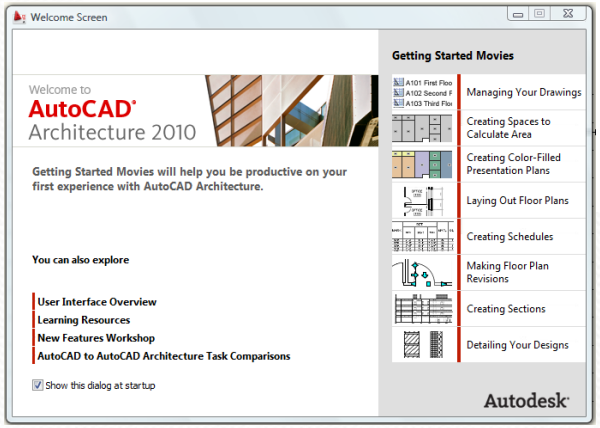
2D line drawings
3D constructions
Rendering
Part Assemblies

Starting AutoCAD

You can start AutoCAD by either double clicking on the program Icon on the desktop or by clicking on the program name in the Start menu. The program will start and after a minute or so should display a screen similar to the one shown below. The dialog box in the middle will aid you in getting started at either creating a new drawing or continuing your work on a drawing that is not finished.



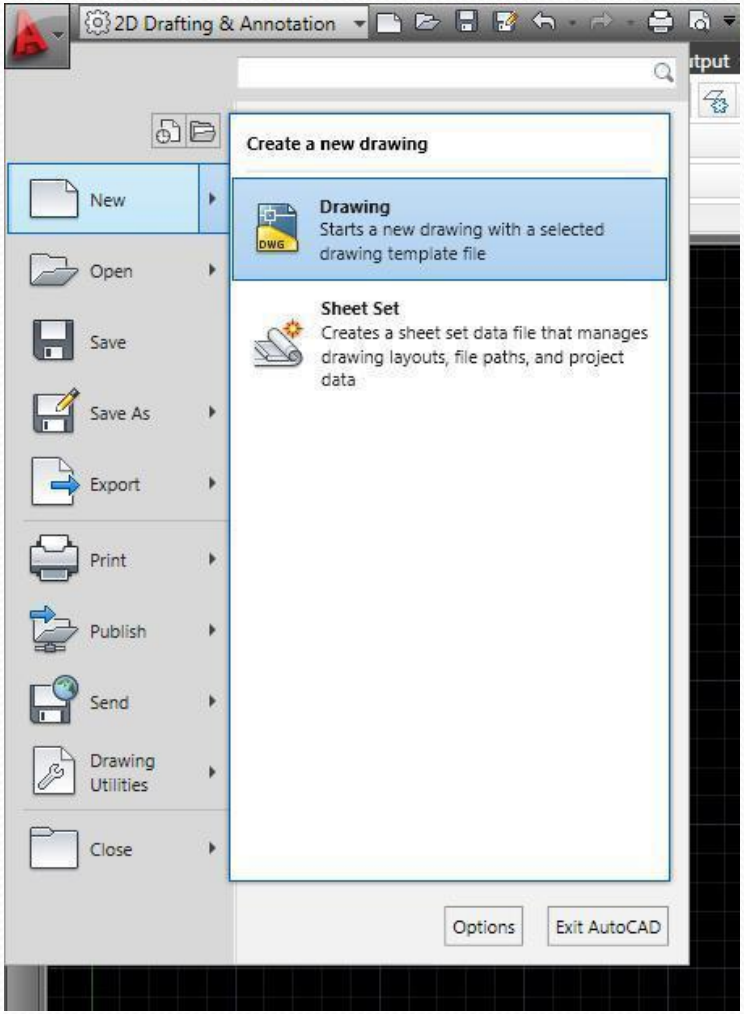




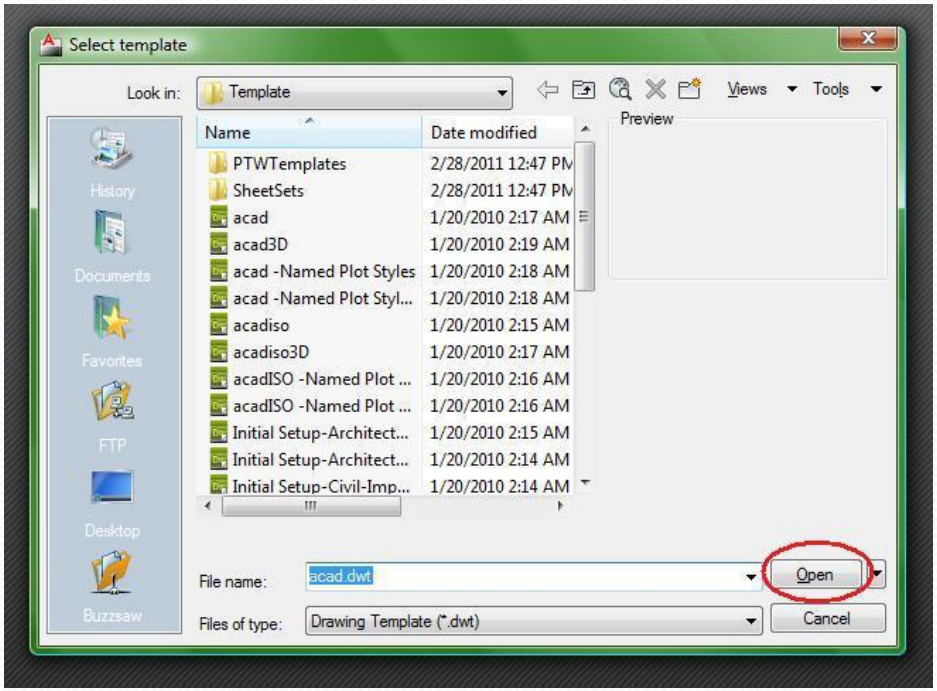
AutoCAD Drawing

Click on the "A" icon in the extreme upper left corner of the window and Open->Drawing.

A "Select File" dialog box will open allowing you to select the drawing file you want to open.



The big A is like the home button in MS Office or the File menu in most programs



AutoCAD Drawing

STARTING A NEW DRAWING

1. Start the command using one of the following:

TYPING: NEW <enter> or press CTRL + N

PULLDOWN: FILE / NEW

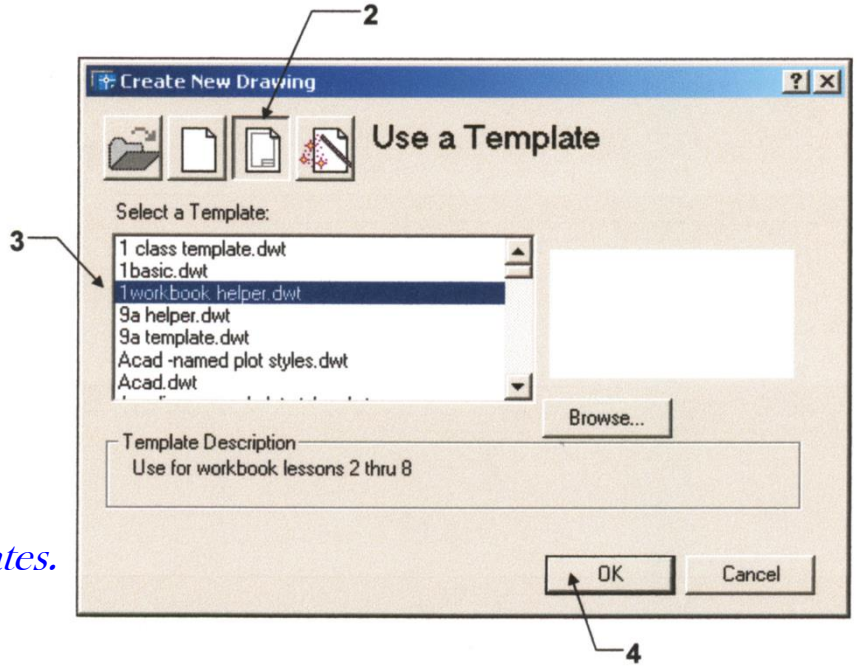
TOOLBAR: STANDARD

The Dialog box shown below should appear.

2. Select the Use a Template box (third from the left).

3. Select 1workbook helper. dwt from the list of templates.

4. Select the OK button (bottom right).



OPENING AN EXISTING DRAWING FILE

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

TYPING: OPEN <enter> or press CTRL + O

PULLDOWN: FILE / OPEN

TOOLBAR: STANDARD

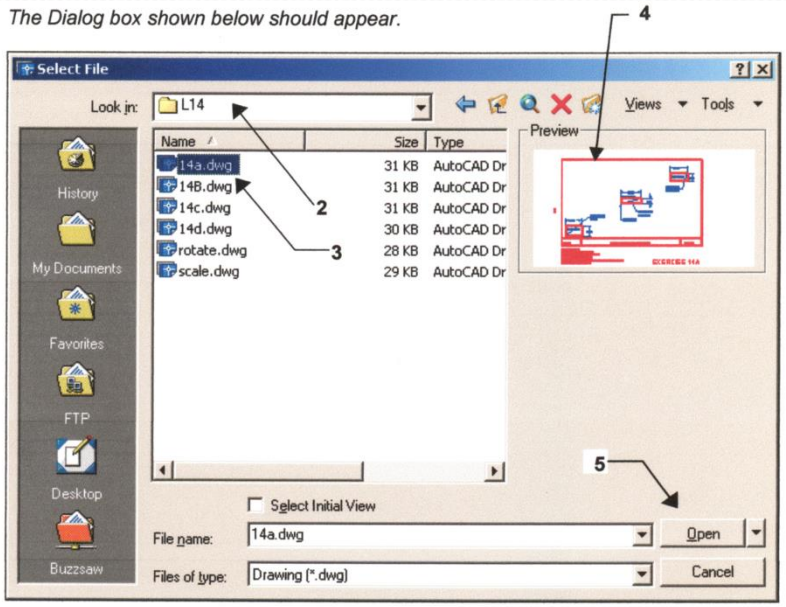
The Dialog box shown below should appear.

2. Select the Drive & Directory from the "LOOK IN" Box.

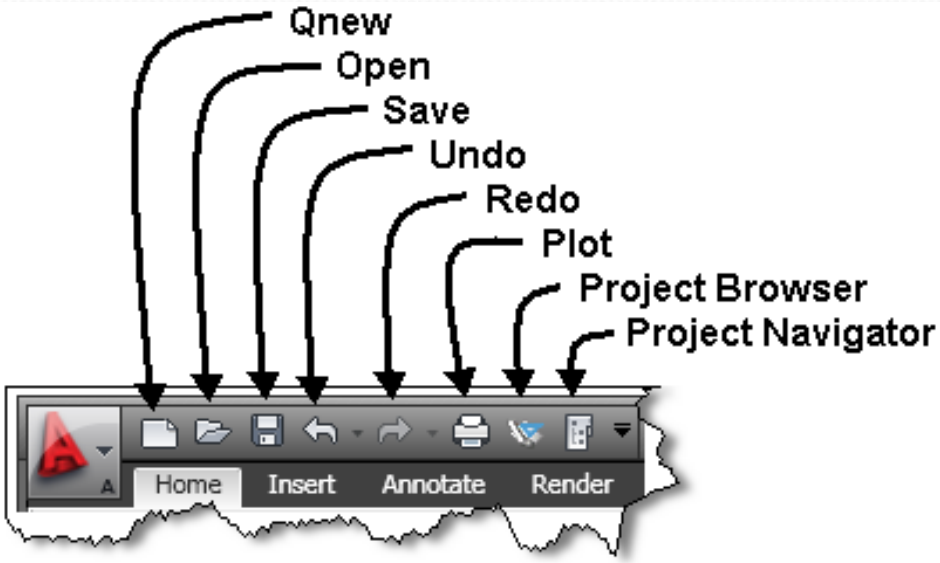
3. Select the drawing file from the list. (You may double click on the file name to automatically open the drawing)

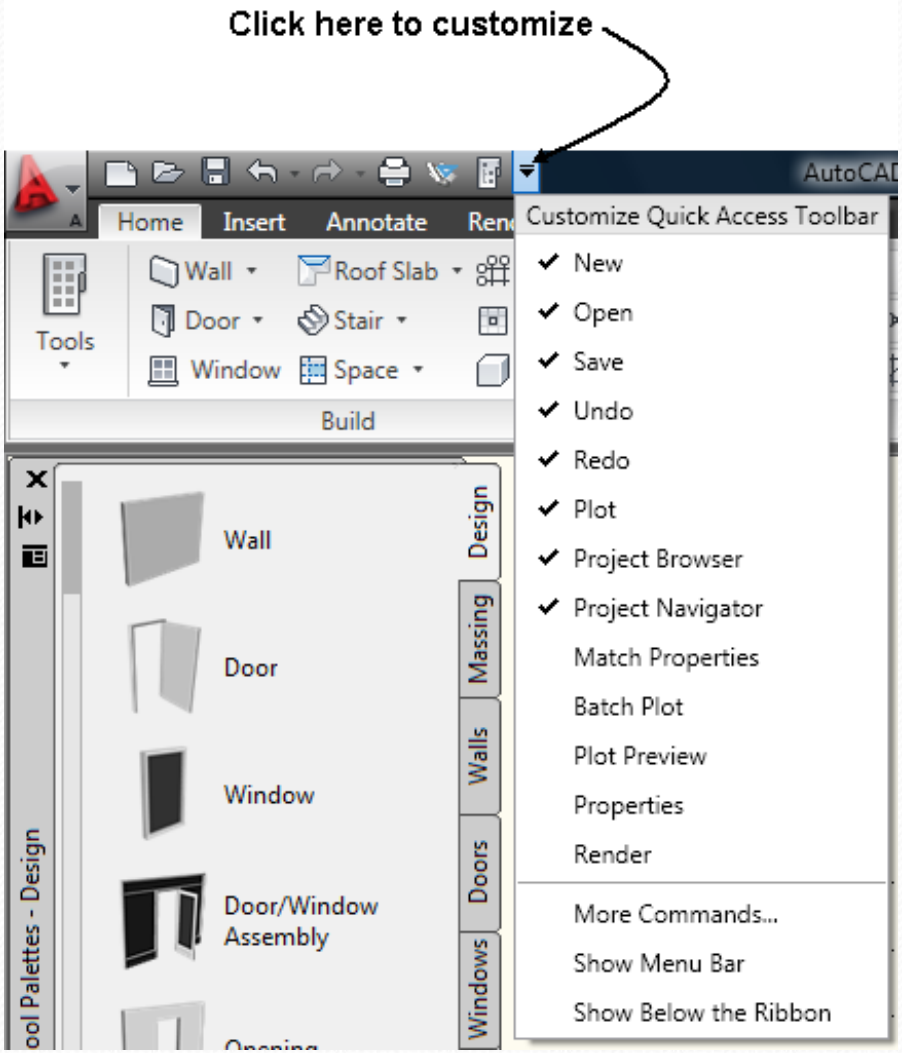
4. The Preview window displays a "Thumbnail Preview Image".

5. Select the OPEN button.

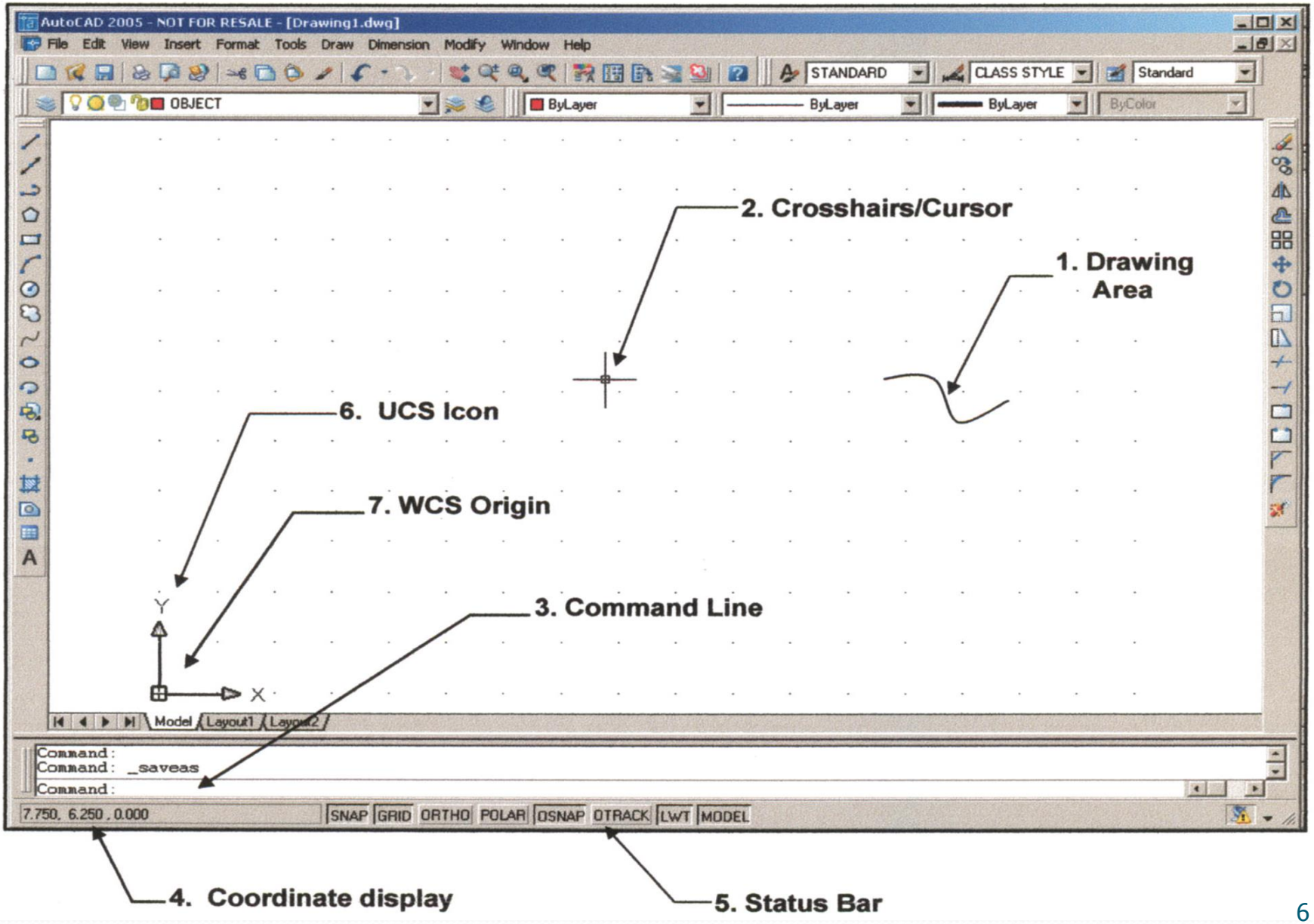


Quick Access Toolbar





AutoCAD Screen



AutoCAD Screen Layout

1. DRAWING AREA

Location: The large area in the center of the screen. This is where you will draw. This area represents a piece of paper. The color of this area can be changed using Tools / Option / Display / Color. The default color is white

2. CROSSHAIRS / CURSOR

Location: Can be anywhere in the Drawing Area. The movement of the cursor is controlled by the movement of the pointing device such as a mouse. You will use the cursor to locate points, make selections and draw objects. The size can be changed using Tools / Options / Display / Crosshair\Size.

3. COMMAND LINE

Location: The three lines at the bottom of the screen. This is where you enter commands and Autocad will prompt you to input information.

4. COORDINATE DISPLAY (F6)

Location: Lower left corner. In the Absolute mode (coords = 1): displays the location of the crosshairs / cursor in reference to the Origin. The first number represents the horizontal movement (Xaxis), the second number represents the vertical movement (Yaxis) and the third number is the Zaxis which is used for 3D. In the Relative Polar mode (coords = 2): displays the distance and angle of the cursor from the last point entered. (Distance<Angle)

AutoCAD Screen Layout

5. STATUS BAR

Location: Below the Command Line.

Displays your current settings. These settings can be turned on and off by clicking on the word (Snap, Grid, Ortho, etc.) or by pressing the function keys, F1, F2, etc. See button descriptions below.

[SNAP] (F9): 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. The increment spacing can be changed at any time using Tools / Drafting Settings / Snap and Grid. The default spacing is .250.

[GRID] (F7): The grid (dots) is merely a visual "drawing aid". The default spacing is 1 unit. You may change the grid spacing at any time using: Tools / Drafting Settings /Snap and Grid.

[ORTHO] (F8): When Ortho is ON, cursor movement is restricted to horizontal or vertical. When Ortho is OFF, the cursor moves freely.

[POLAR] (F10): POLAR TRACKING creates “Alignment Paths” at specified angles.

[OSNAP] (F3): RUNNING OBJECT SNAP. Specific Object Snaps can be set to stay active until you turn them off.

[OTRACK] (F11): OBJECT SNAP TRACKING. Creates “Alignment Paths” at precise positions using object snap locations.

[LWT] LINEWEIGHT: Displays the width assigned to each object.

MODEL: Switches your drawing between **paperspace and modelspace.**

6. UCS ICON (User Coordinate System):

Location: Lower left corner of the screen. The UCS icon indicates the location of the Origin. The UCS icon appearance can be changed using: View / Display / Icon /Properties.

7. ORIGIN:

The location where the X, Y and Z axes intersect. 0,0,0

Snaps, etc.

Snap to Grid

- cursor snaps to grid points

Show Grid

- displays grid in model space

Orthographic

- constrains lines to 90deg angles

Polar Snap

- constrains lines to other angle increments

Object Snap

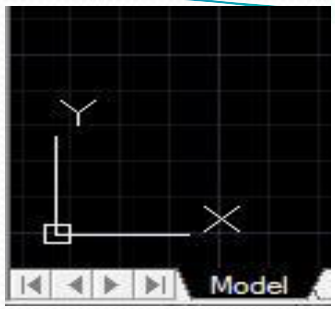
- cursor snaps to points on objects

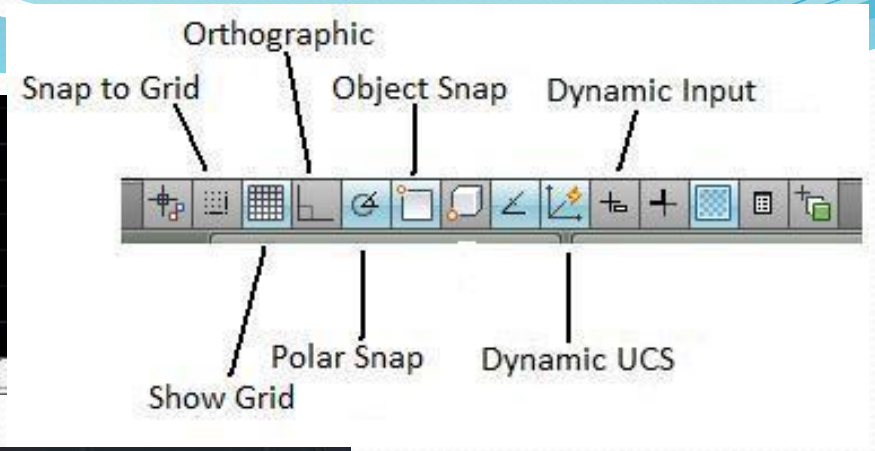
Dynamic UCS

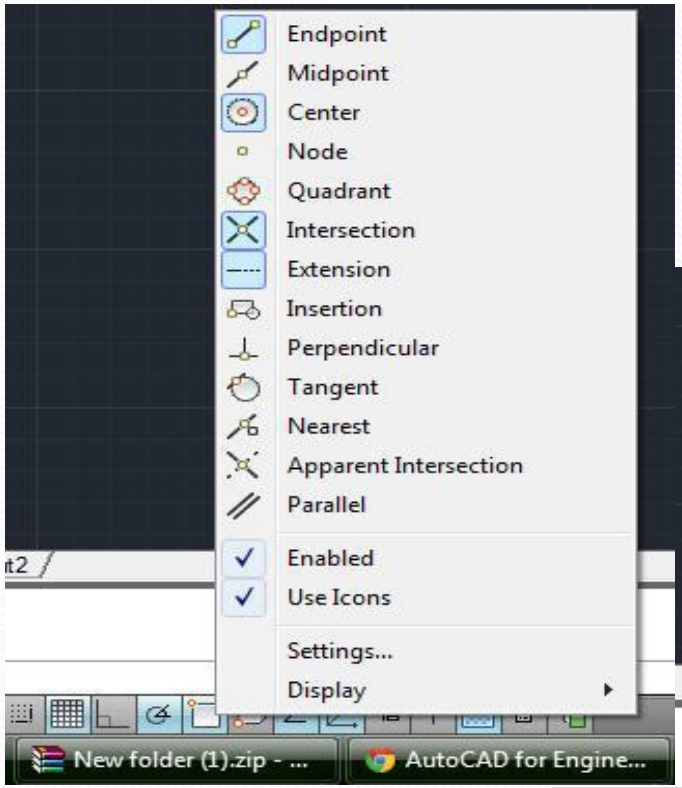
- shows UCS at all times

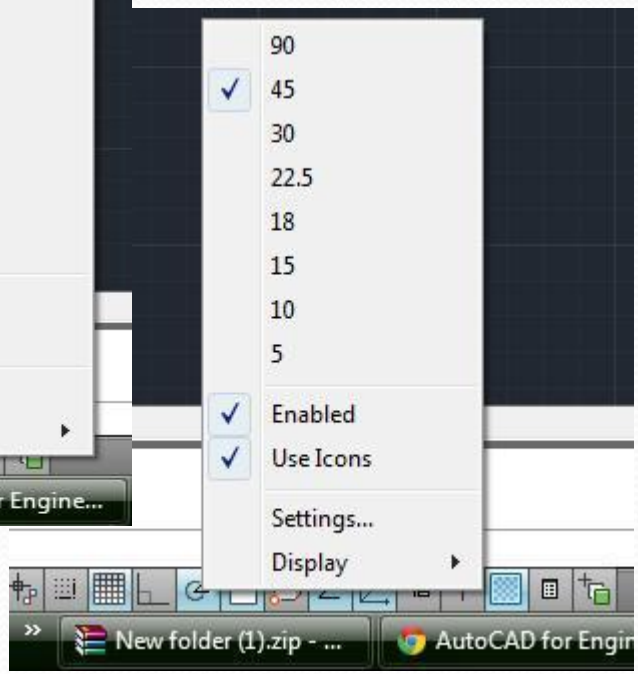
Dynamic Input

- displays input text in space









AutoCAD Screen Layout

FUNCTION KEYS

F1 Help Explanations of Commands.
F2 Flipscreen Toggles from Text Screen to Graphics Screen.
F3 Osnap Toggles Osnap On and Off.
F4 Tablet Toggles the Tablet On and Off.
F5 Isoplane Changes the Isoplane from Top to Right to Left.
F6 Coordinate Display Changes the display from ON / Off /.
F7 Grid Toggles the Grid On or Off.
F8 Ortho Toggles Ortho On or Off.
F9 Snap Toggles Increment Snap on or off.
F10 Polar Toggles Polar Tracking On or Off.
F11 Otrack Toggles Object Snap Tracking On and Off.

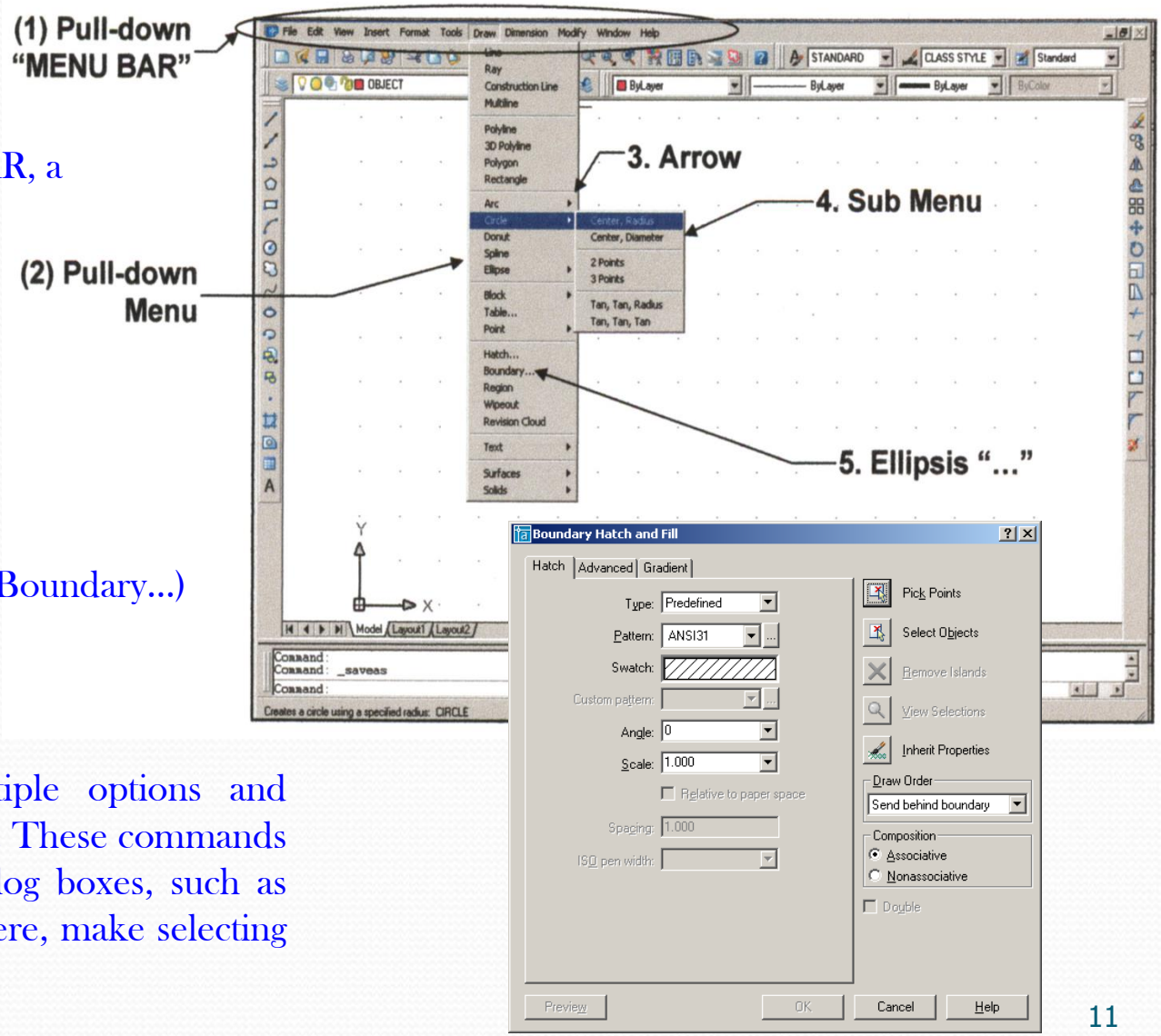
SPECIAL KEY FUNCTIONS

Escape Key: Cancels the current command, menu or Dialog Box.
Enter Key: Ends a command, or will repeat the previous command if the command line is blank.
Space Bar : Same as the Enter Key, except when entering text

Pull-Down "Menu Bar"

File Edit View Insert Format Tools Draw Dimension Modify Express Window Help

(1) The pull-down "MENU BAR" is located at the top of the screen. By selecting any of the words in the MENU BAR, a **(2) Pull-down menu** appears. If you select a word from the pull-down menu that has an **(3) Arrow** , a **(4) Sub Menu** will appear. (Example : Draw / Circle) If you select a word with **(5) Ellipsis ...** , a dialog box will appear. (Example: Draw / Boundary...)



DIALOG BOX

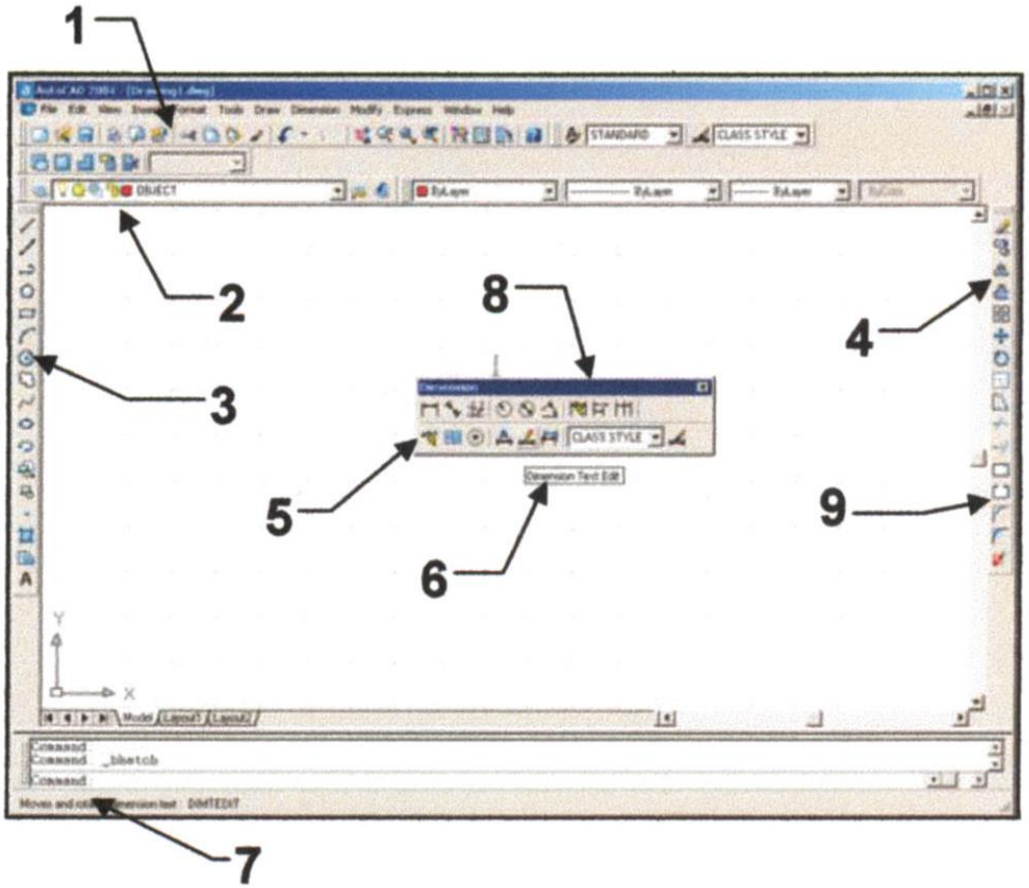
Many commands have multiple options and require you to make selections. These commands will display a dialog box. Dialog boxes, such as the Hatch dialog box shown here, make selecting and setting options easy.

Toolbars

AutoCAD provides several toolbars to access frequently used commands. **(1)Standard, (2) Object Properties, (3) Draw, and (4) Modify toolbars are displayed by default.**

Toolbars contain **icon buttons (5).** These icon buttons can be selected to Draw or Edit objects and manage files. If you place the pointer on any icon and wait a second, **a tool tip (6)** will appear and a **help message (7)** will appear at the bottom of the screen.

Toolbars can be "floated" or "docked".

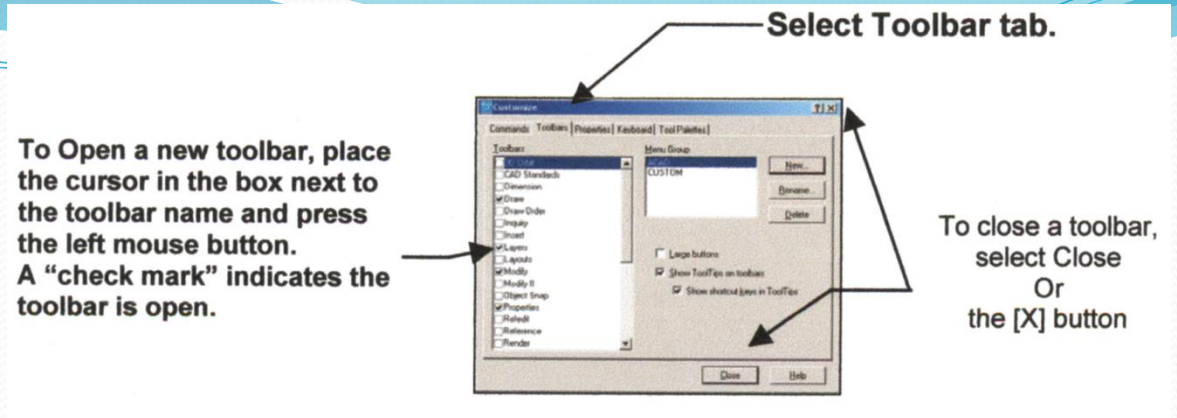


Floating toolbars (8) move freely in the drawing area and can be resized. To move, place the pointer on the toolbar title then hold the left mouse button down, drag to the new location and release the mouse button. To resize, place the pointer on the right or bottom edge of the toolbar. When the pointer changes to a double ended arrow, hold the left mouse button down and drag. When desired size is achieved, release the mouse button. **Docked toolbars (9)** are locked into place along the top, bottom or sides of the AutoCad Window. To dock, place the pointer on the toolbar title, hold the left mouse button down and drag to the top, bottom, or either side of the AutoCAD window. When the outline of the toolbar appears, release the mouse button.

Toolbars

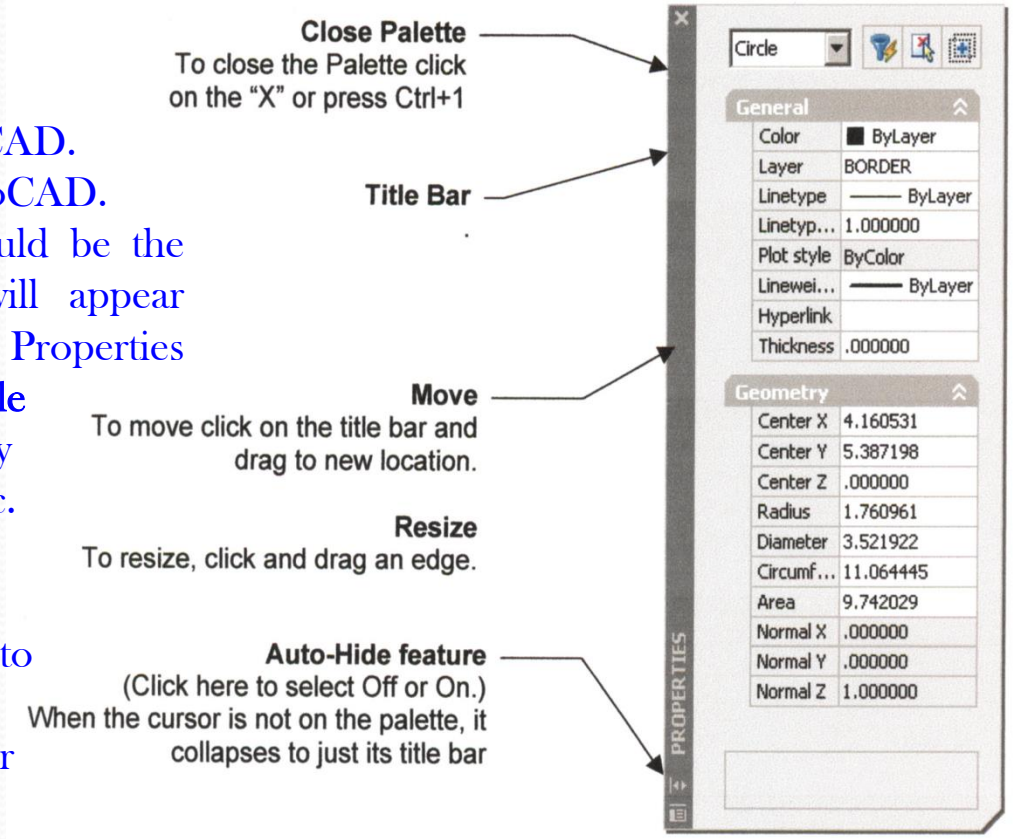
OPEN OR CLOSE TOOLBARS

Many other toolbars are available by selecting View / Toolbars from the Pull-down menu. Select the "Toolbars" tab. A list of available toolbars will appear. (A check mark indicates the toolbars that are "open".)



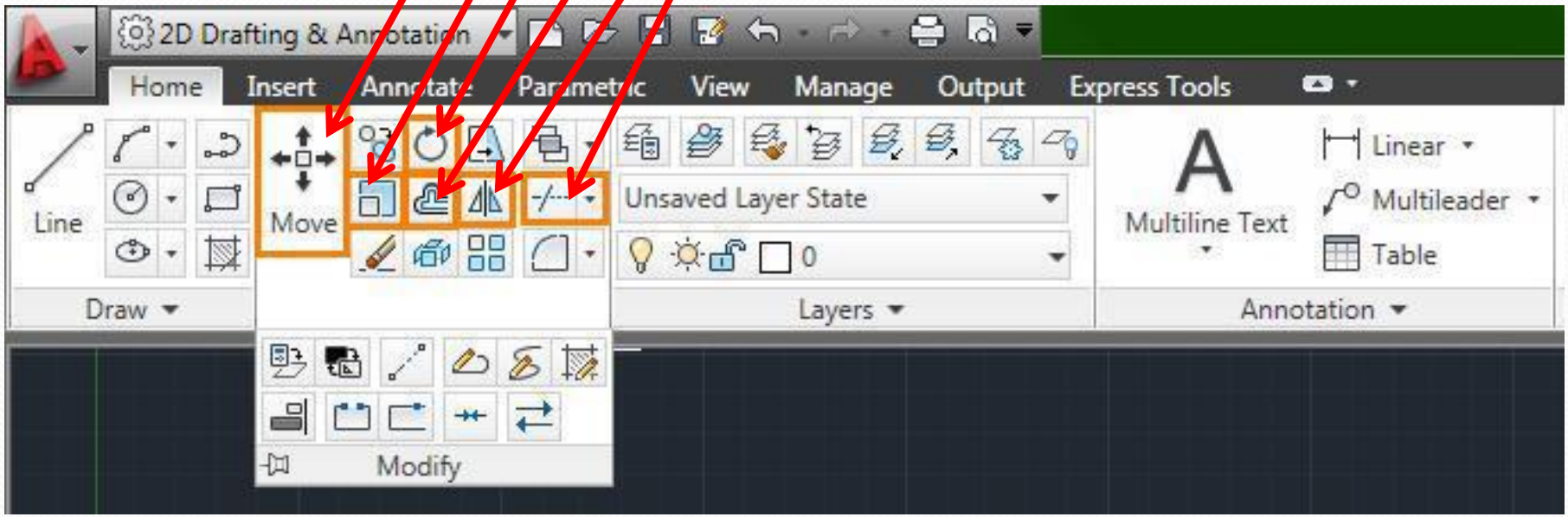
PALETTES

There are two types of Palettes within AutoCAD. The first type has been pre-designed by AutoCAD. An example of a pre-designed palette would be the Properties Palette shown This palette will appear automatically when you select the Properties command. **The second type is a customizable Palette** that you may create to hold frequently used commands, hatch patterns, symbols, etc. Palettes may be resized and moved to any location on the screen. They can be docked or float. The Auto-Hide function allows you to collapse the palette when the cursor is away From the palette. When you move the cursor over the Title Bar the Palette will reappear.



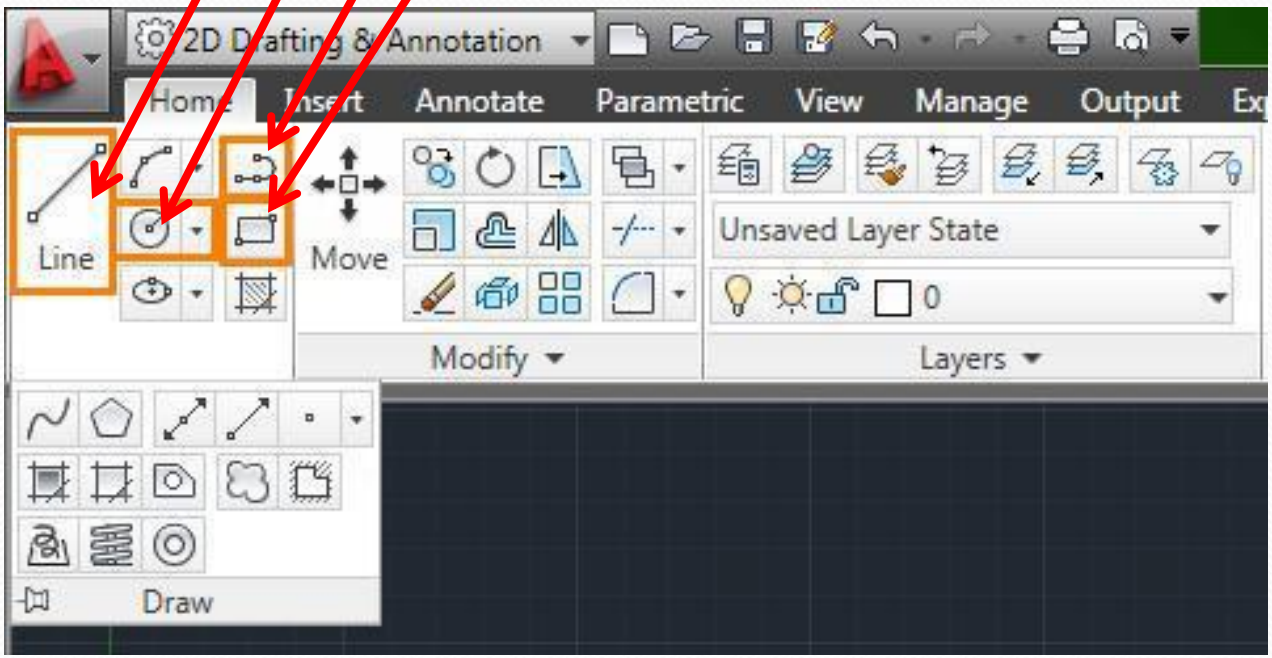
Command Interface

Move (M)
Scale (SC)
Rotate (RO)
Offset (O)
Mirror (MI)
Trim (TR)



Some 2D Common Commands

Line (L)
Circle (C)
Polyline (PL)
Rectangle (REC)

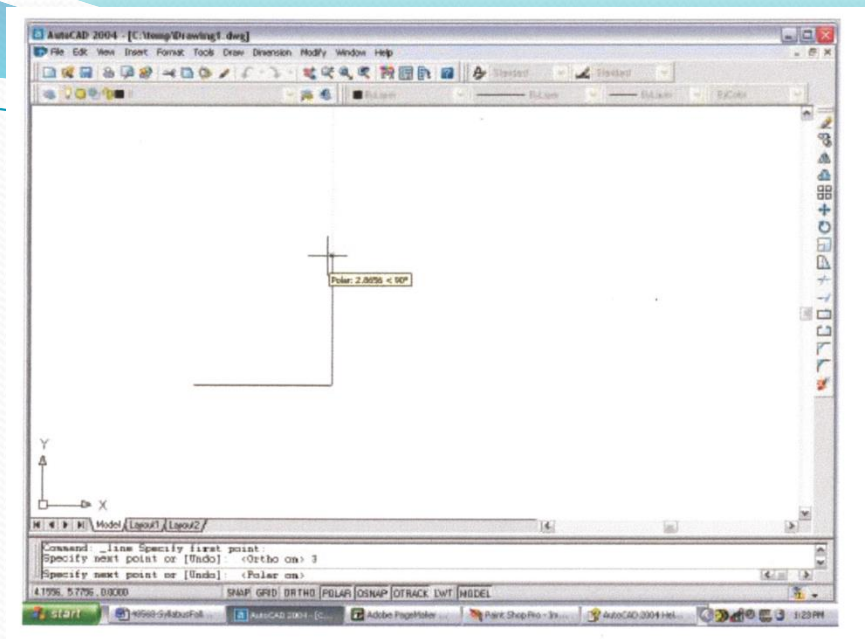


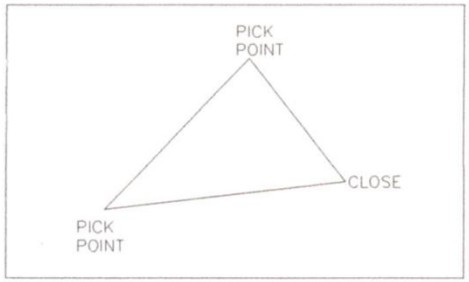
Drawing Lines (L)

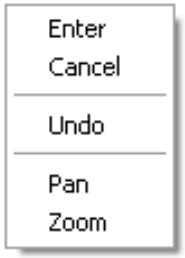
Creates single straight line segments

1. Choose **Draw, Line,** or
2. Click the Line icon, or

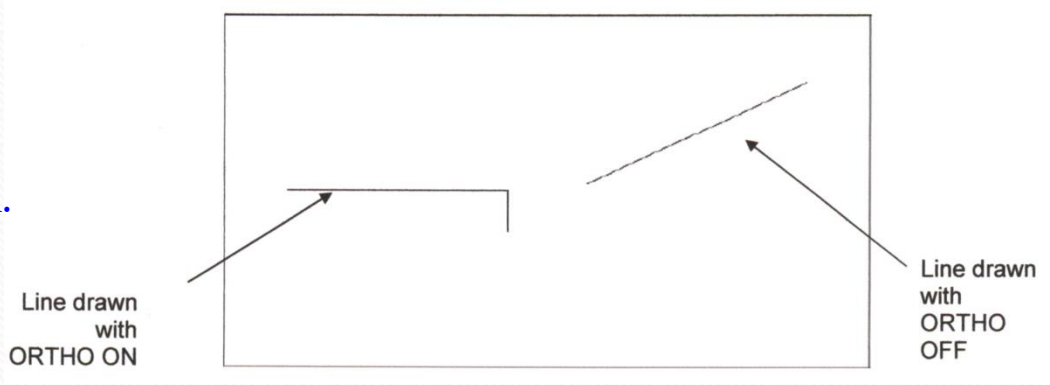
3. ***Type LINE*** **from** the command Prompt. Command: **LINE or L**
4. Press ENTER
5. Pick From point: (point)
6. Pick Specify next point or [Close/Undo]:(point)
7. Pick Specify next point or [Close/Undo]:(point)
8. Press ENTER to end line sequence, or
9. Type U to undo the last segment To point: U (undo), or
10. Type C to create a closed polygon To point : C (close)







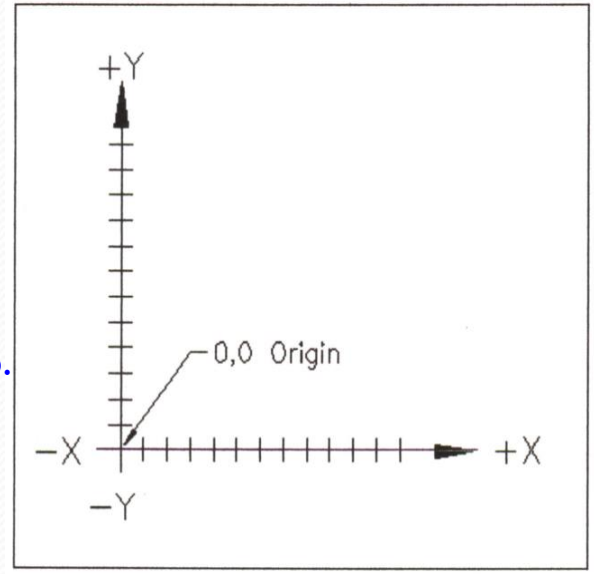
TIPS: You can continue the previous line or arc by responding to the From point: prompt with a space or ENTER. Choose the right mouse button for the line pop-up menu to appear while in the line command



Drawing Lines (L)

Cartesian Coordinate System

AutoCAD provides the user with an infinite two dimensional area to work with. Any entities place on the working two dimensional plane can be defined relative to the Cartesian coordinate system. The Cartesian coordinate system divides a two dimensional plane with two perpendicular axis. The X axis runs horizontal across the bottom of the screen. The Y axis runs vertically along the left side of the screen. These two axis intersect at the bottom left corner of the screen. Each of these axis is further divided into segments. Each segment is given a value. The X axis segments increase in value to the right. The positive X values are to the right of the intersection of the two axis. The negative X values are to the left. The positive Y values are above the intersection and increase up. The negative Y values are below.



Absolute Coordinates

Type x,y coordinate

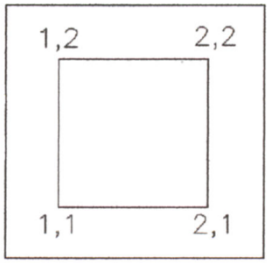
From point: **1,1**

To point: **2,1**

To point: **2,2**

To point: **1,2**

To point: **1,1**



Relative Coordinates

Type @deltax,deltay

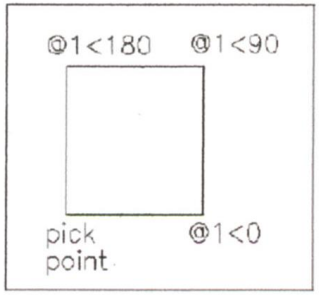
From point pick point

To point: **@1,0**

To point: **@0,1**

To point: **@-1,0**

To point: **@0,-1**



Polar Coordinates

Type @distance<angle

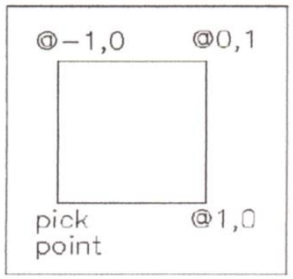
From point: pick point

To point:**@1<0**

To point:**@1<90**

To point:**@1<180**

To point:**@1<270**



Drawing Circles

Circle Command

1. Choose Draw, Circle, or
2. Click the Circle icon, or
3. Type CIRCLE at the command prompt.

Command: CIRCLE

4. Type One of the following options:

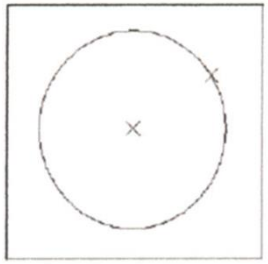
3P/2P/TTR/<<center point>>:, or

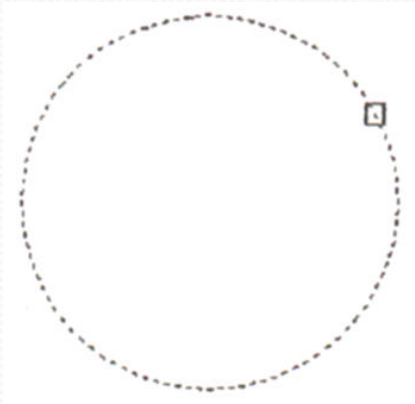
5. Pick A center point.
6. Type A radius or diameter, or
7. Pick A radius or diameter

Diameter/<<radius>>:

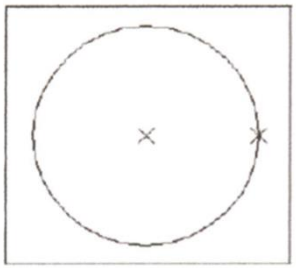
TIPS: To create circles that are the same size, press ENTER when asked for the circle radius. When selecting a circle with a pickbox, be sure to select the circumference of the circle.

Circle, Center Radius

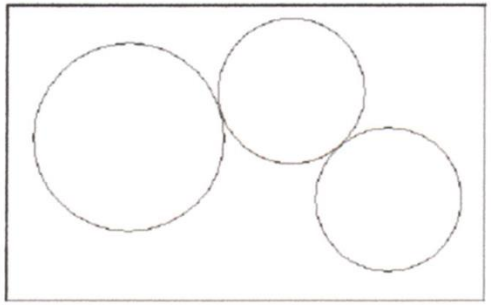




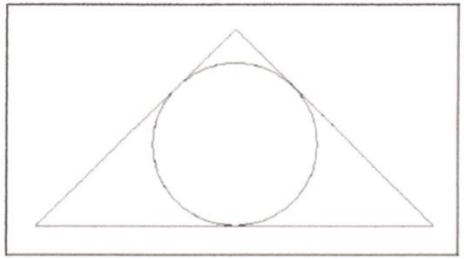
Circle, Center Diameter



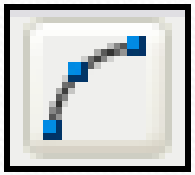
Circle, Tangent, Tangent Radius



Circle, Tangent, Tangent, Tangent



Drawing Arc



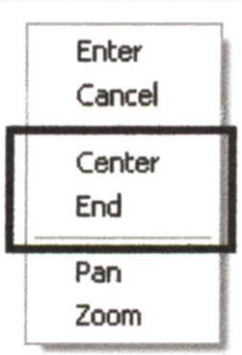
Arc Command

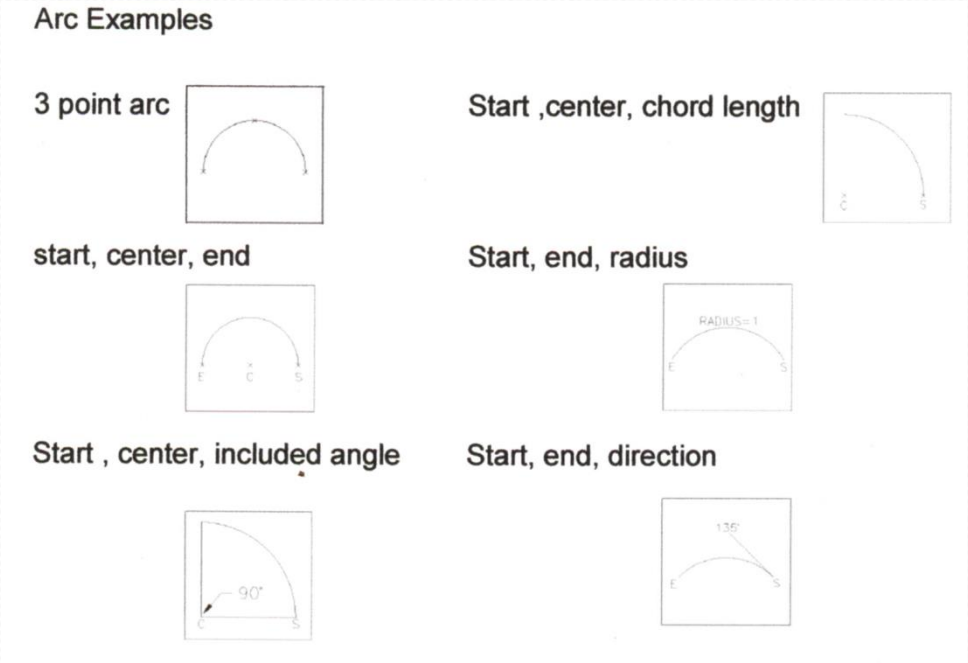
1. Choose Draw, Arc. or
2. Click the Arc icon., or
3. Type ARC at the command prompt

Command: ARC

4. Draw One of the arcs.

TIPS: Except for 3 point arcs, arcs are drawn in a COUNTERCLOCKWISE direction. While in the arc command, press the right mouse button to select the following options for arcs:

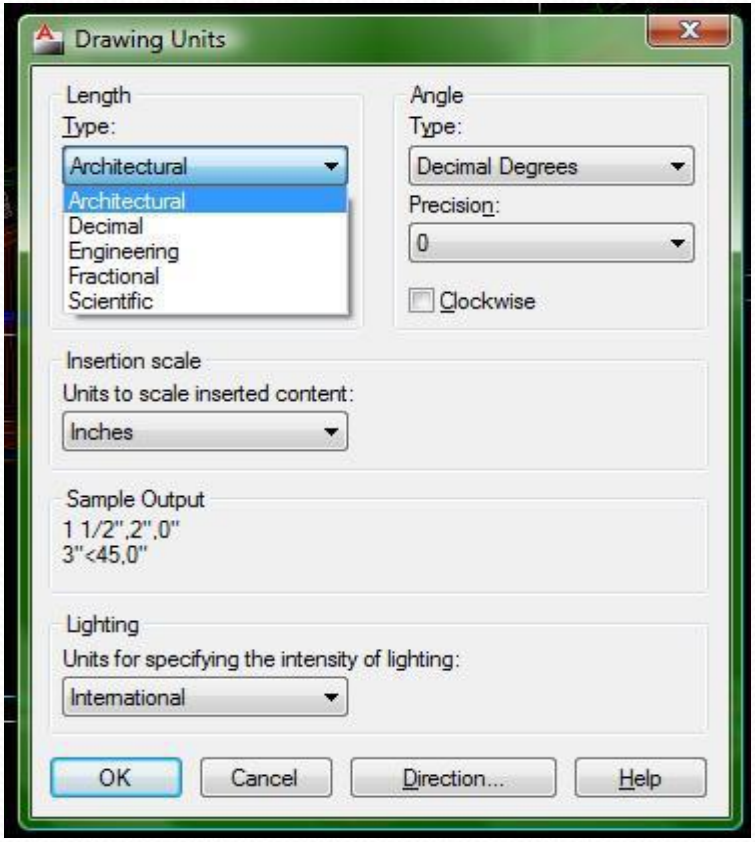


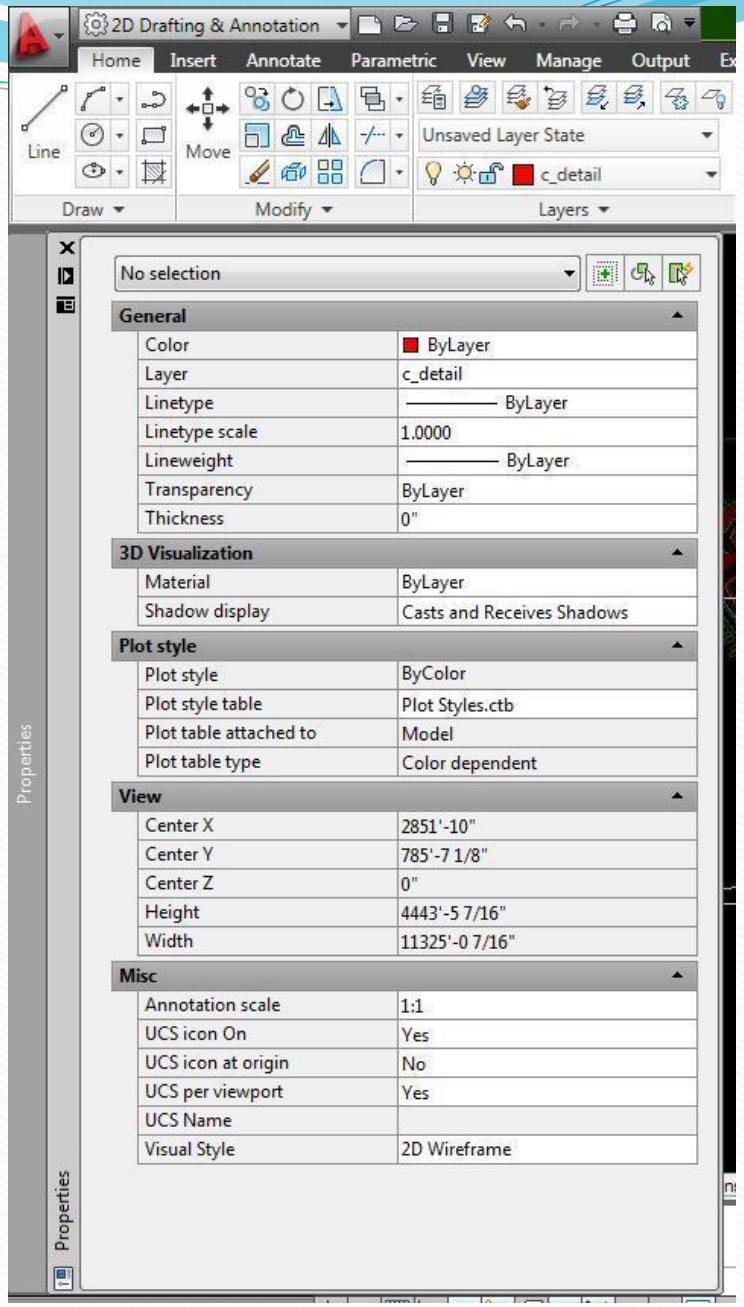


Units and Properties

The units command will let you change the primary units you will be drawing in

Properties will let you change just about anything with respect to the selected item



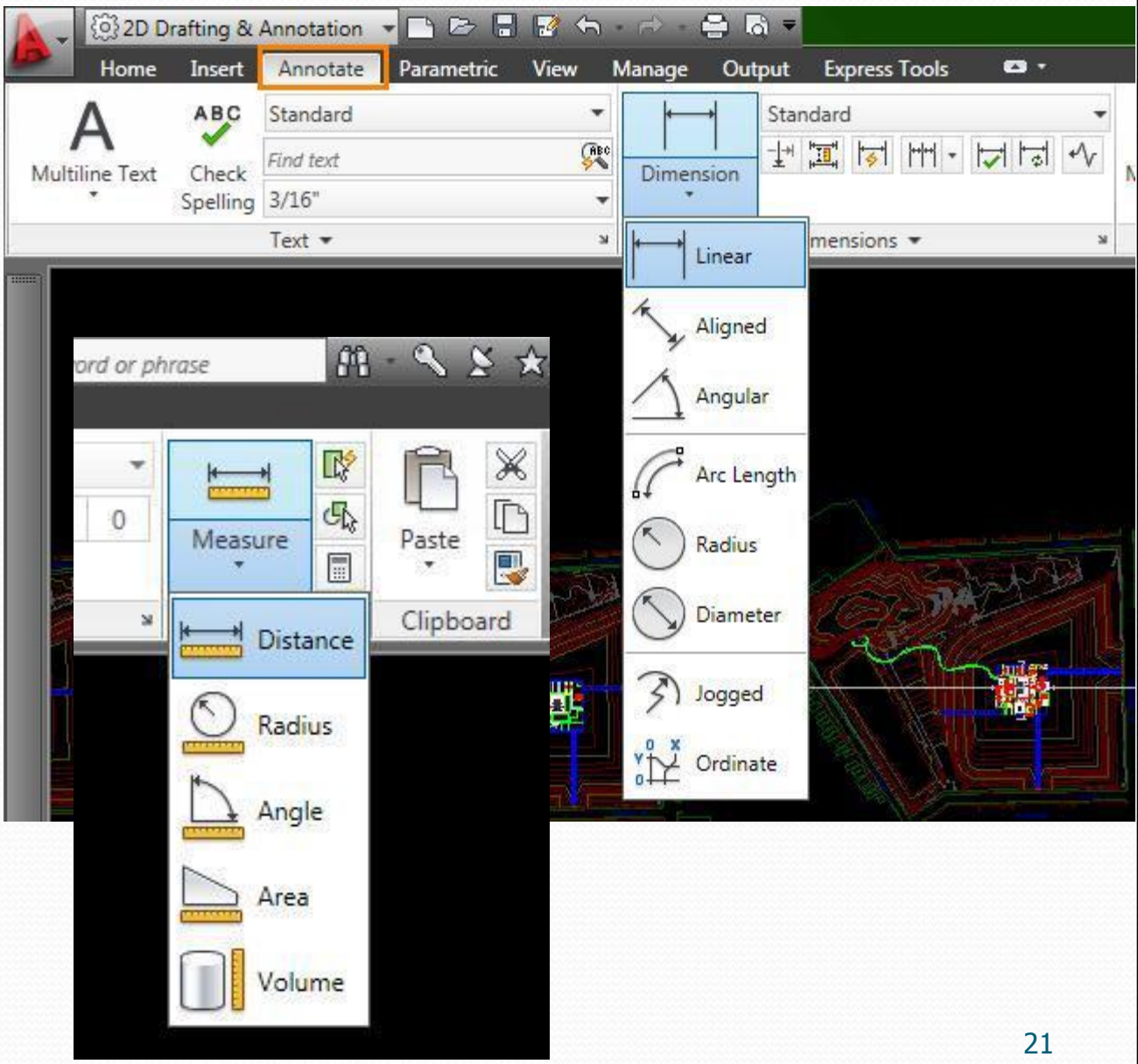


Measure and Dimension

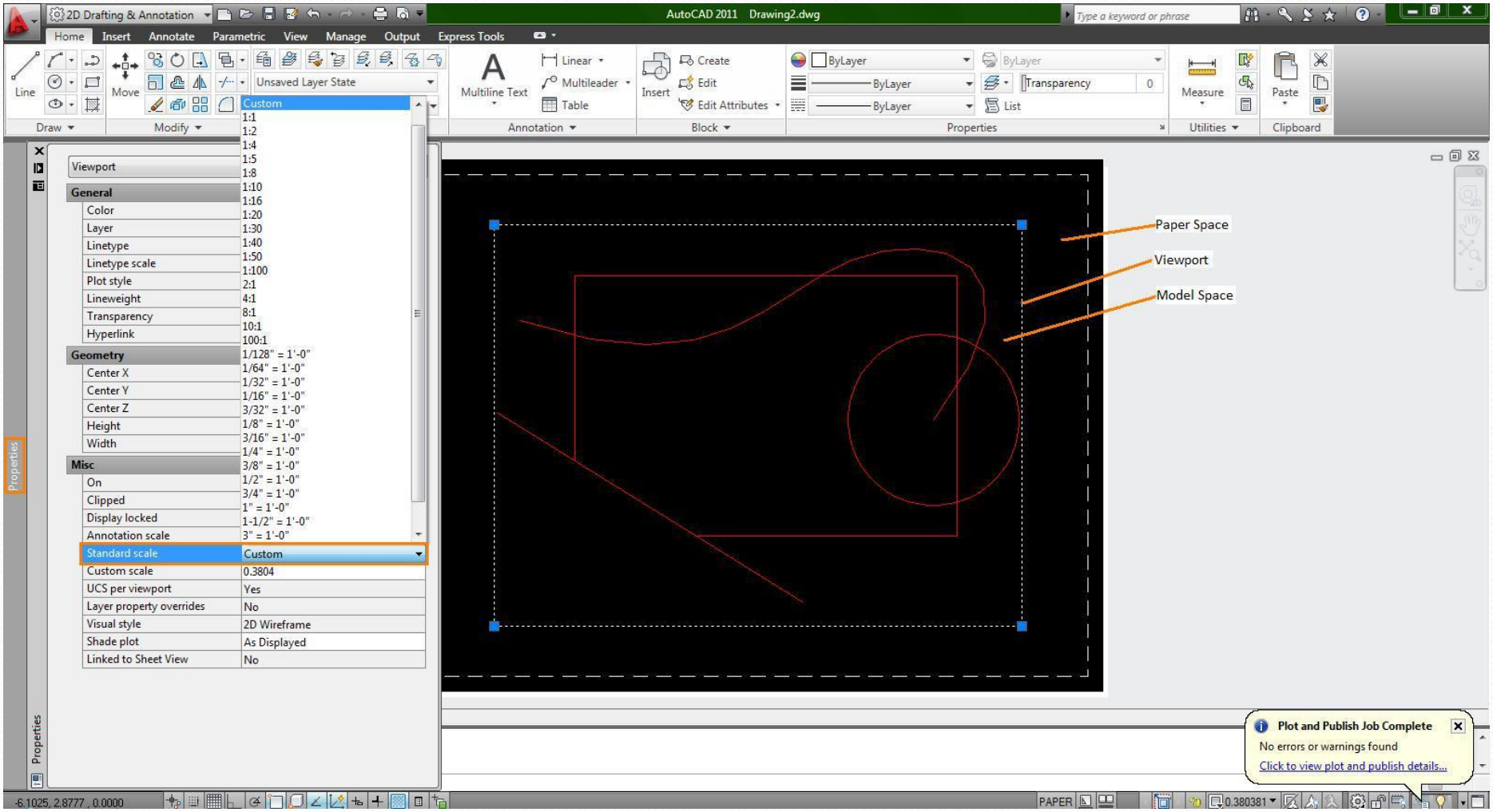
The measure option has two important sub-commands:

- Distance (DI)
- Area (AREA)

The dimension tool has many options, and displays the measurement in the drawing

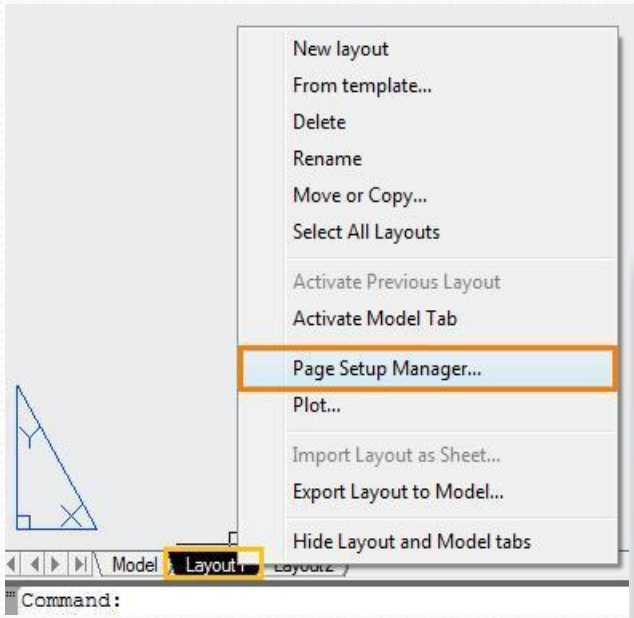


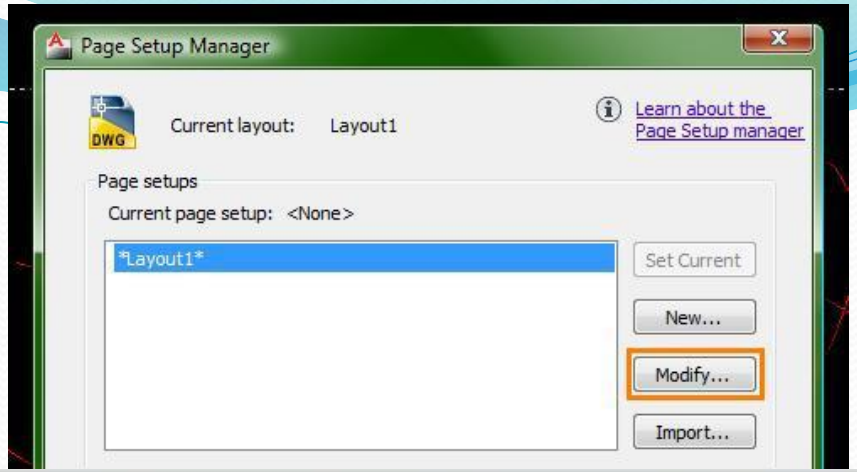
Viewports

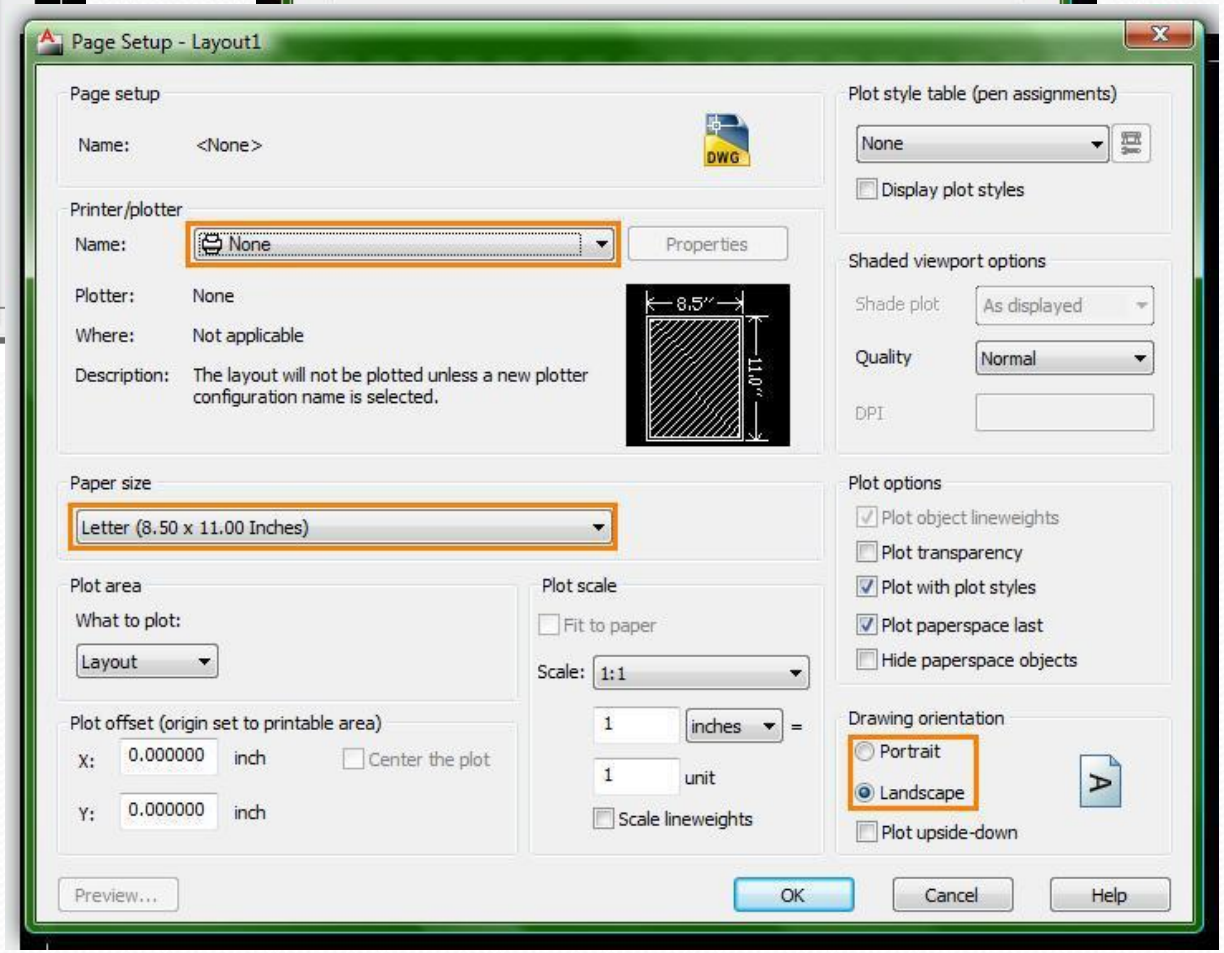


Viewports in layouts help you arrange your drawings into organized sheets at specific scales

Setting Up to Print

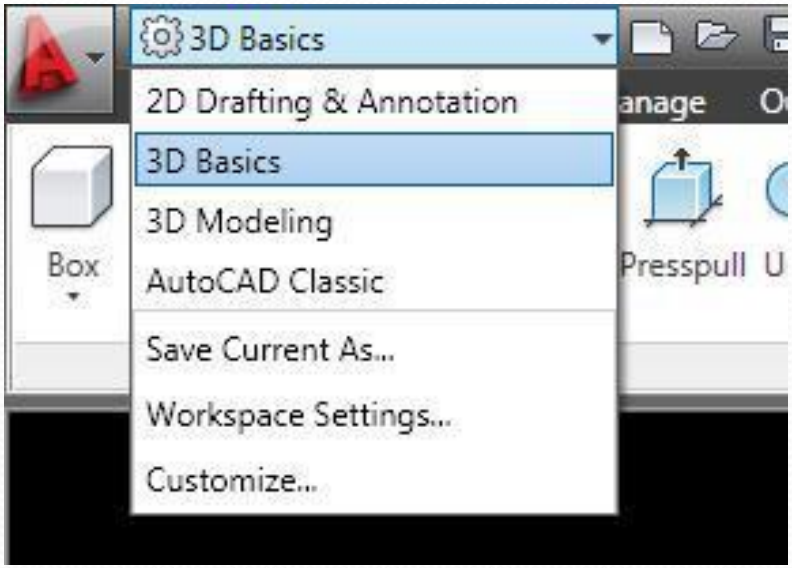


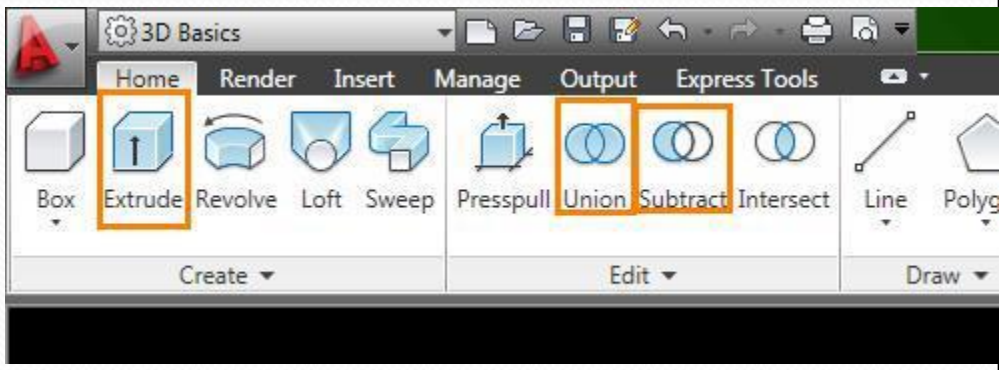




You can apply a page setup to your layout to make the printing process quicker every time

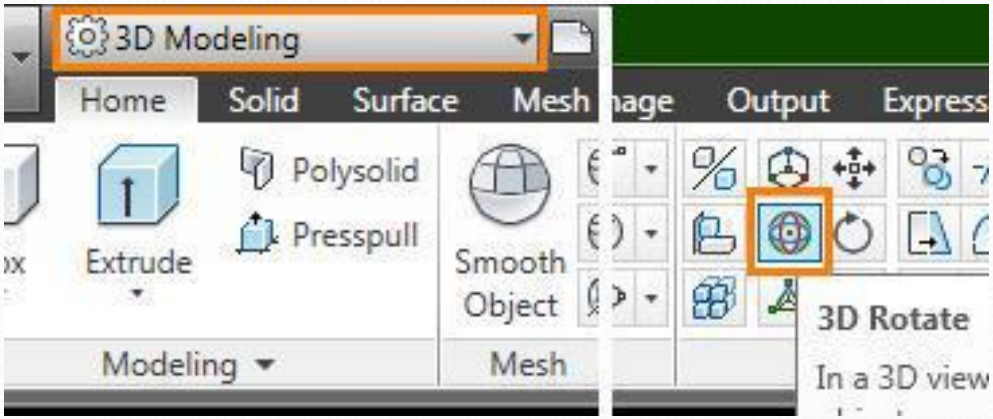
3D





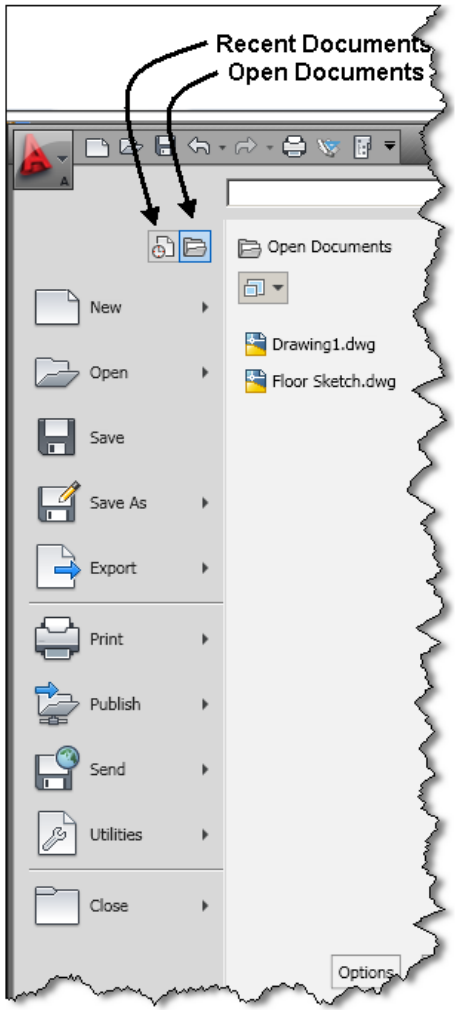
You can change the user interface to 3D Basics or Modeling if you want to use buttons, or you can use keyboard entries

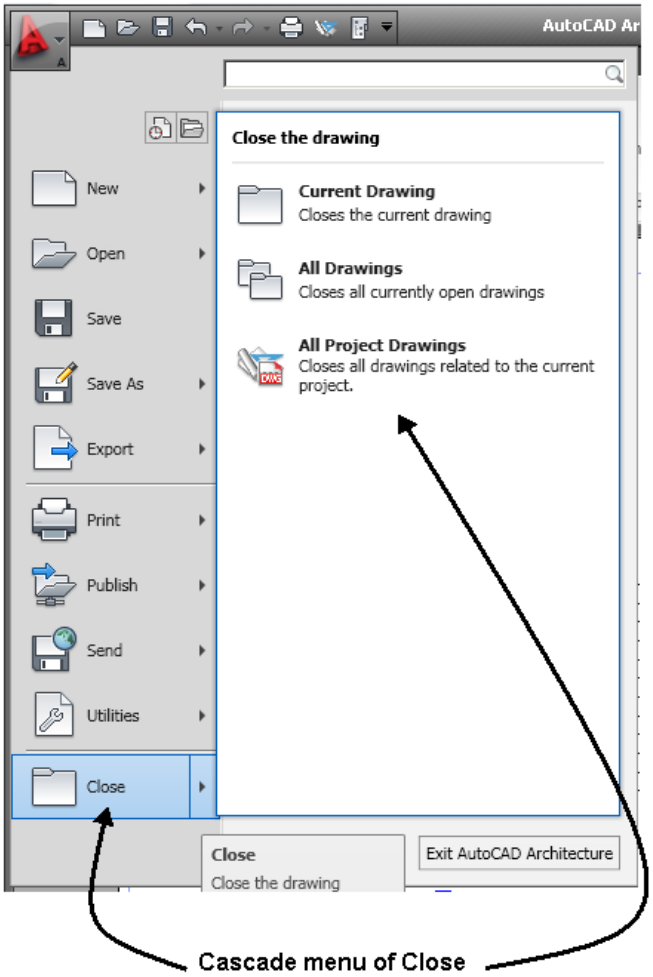
- EXT
- UNI
- SU

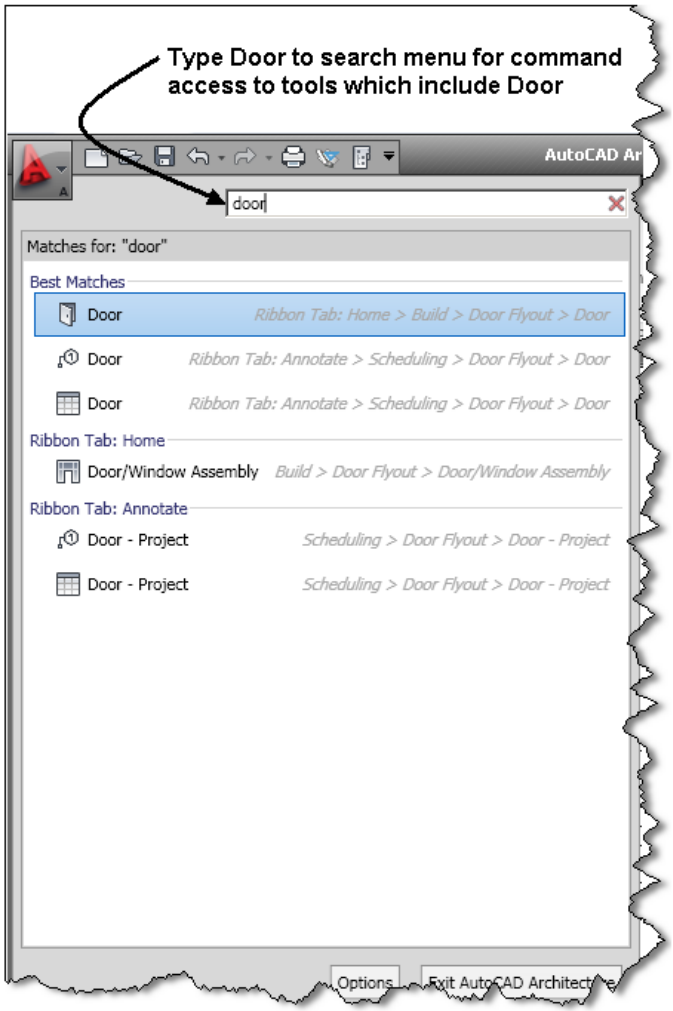


You can rotate an object about the X or Y axis with the 3D rotate command (3R)

Application Menu

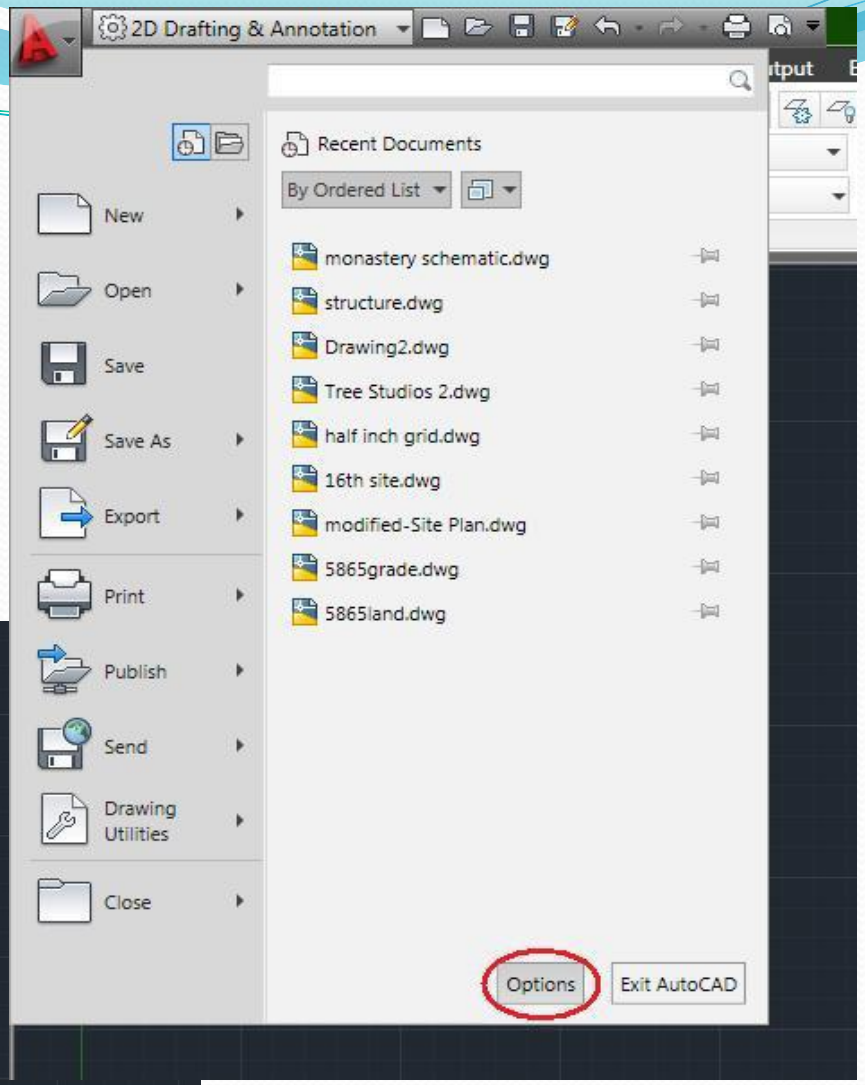


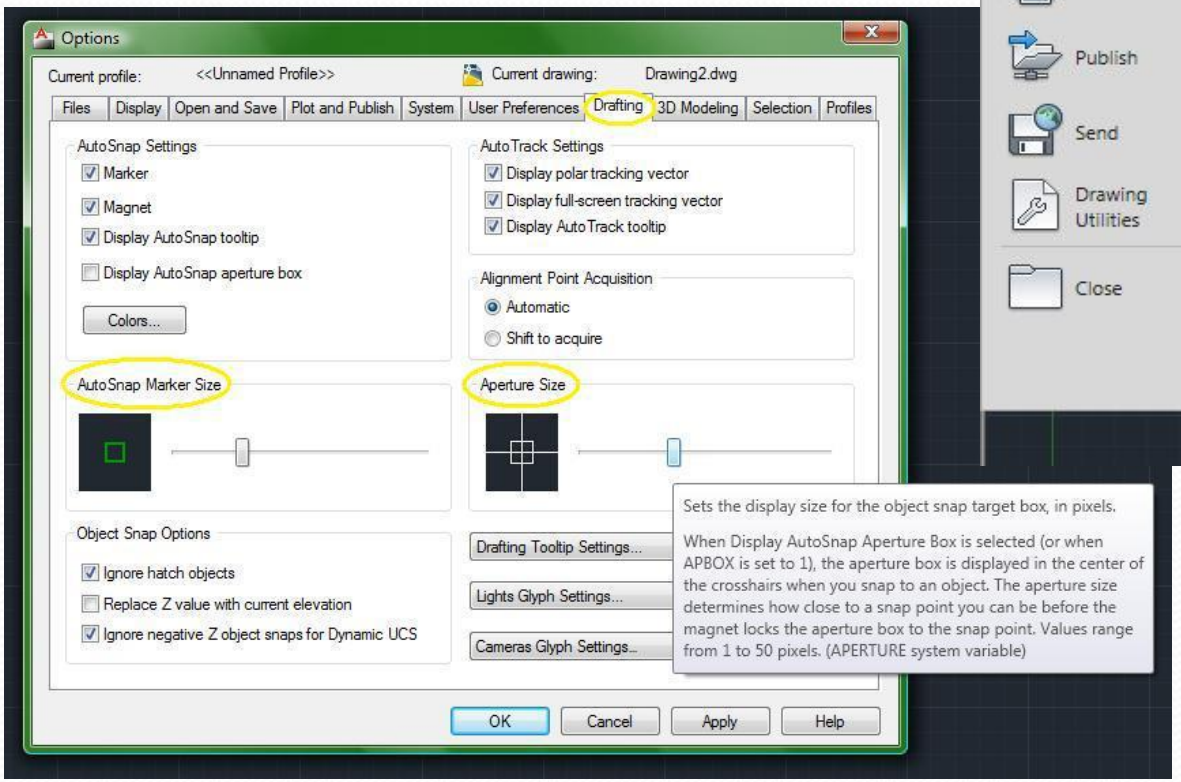




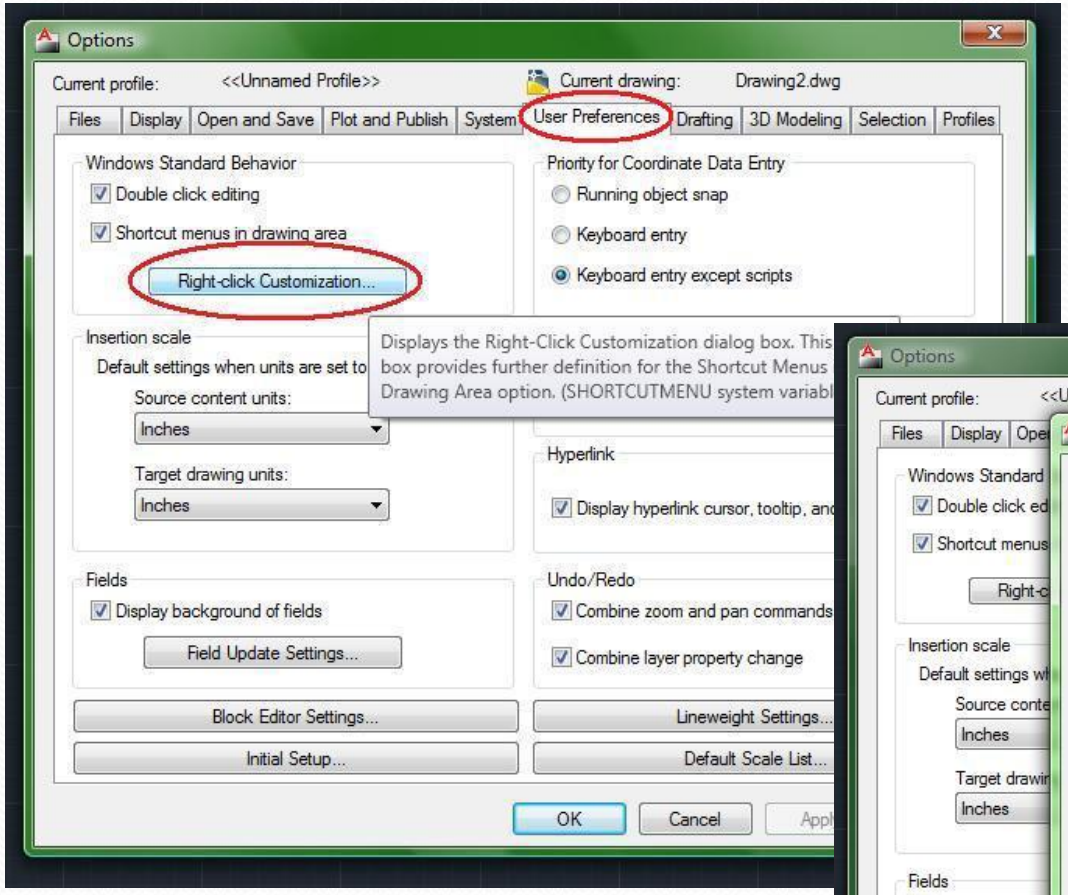
Setting Up the Workspace

The options window lets you set all your preferences within the drawing. Snap and Aperture settings are on a totally personal basis

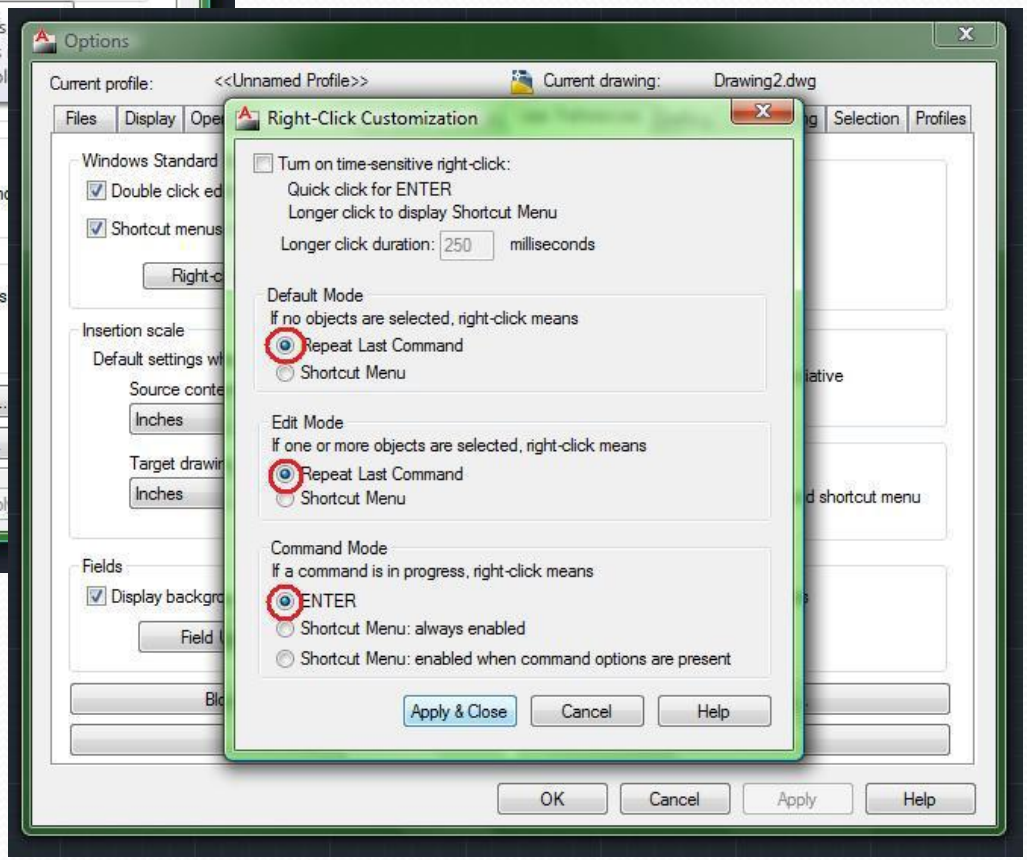




Right Click Customization

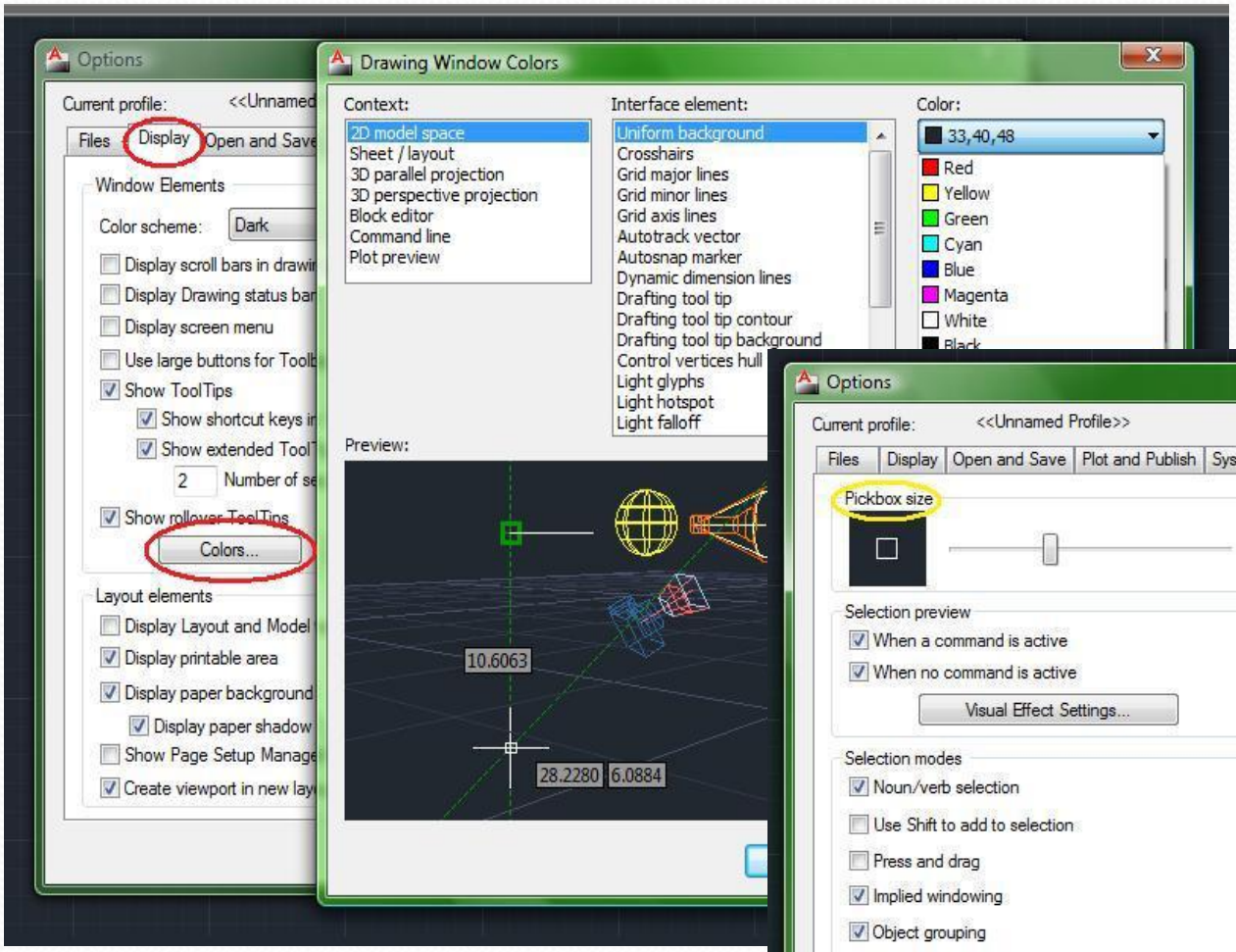


Right-click settings are also personal preference

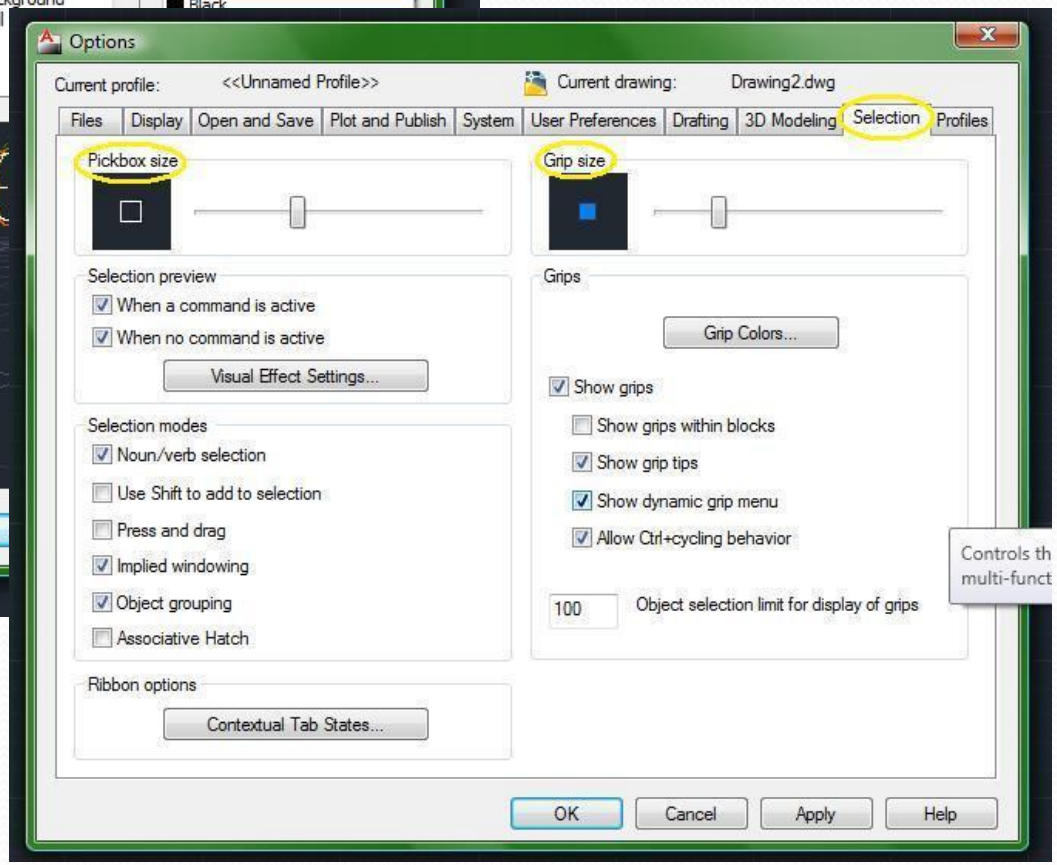


Repeating commands and meaning enter make the drawing process faster

Preferences



You can set the color of just about anything in the drawing



The pick-box and grip sizes will help you manipulate your drawing