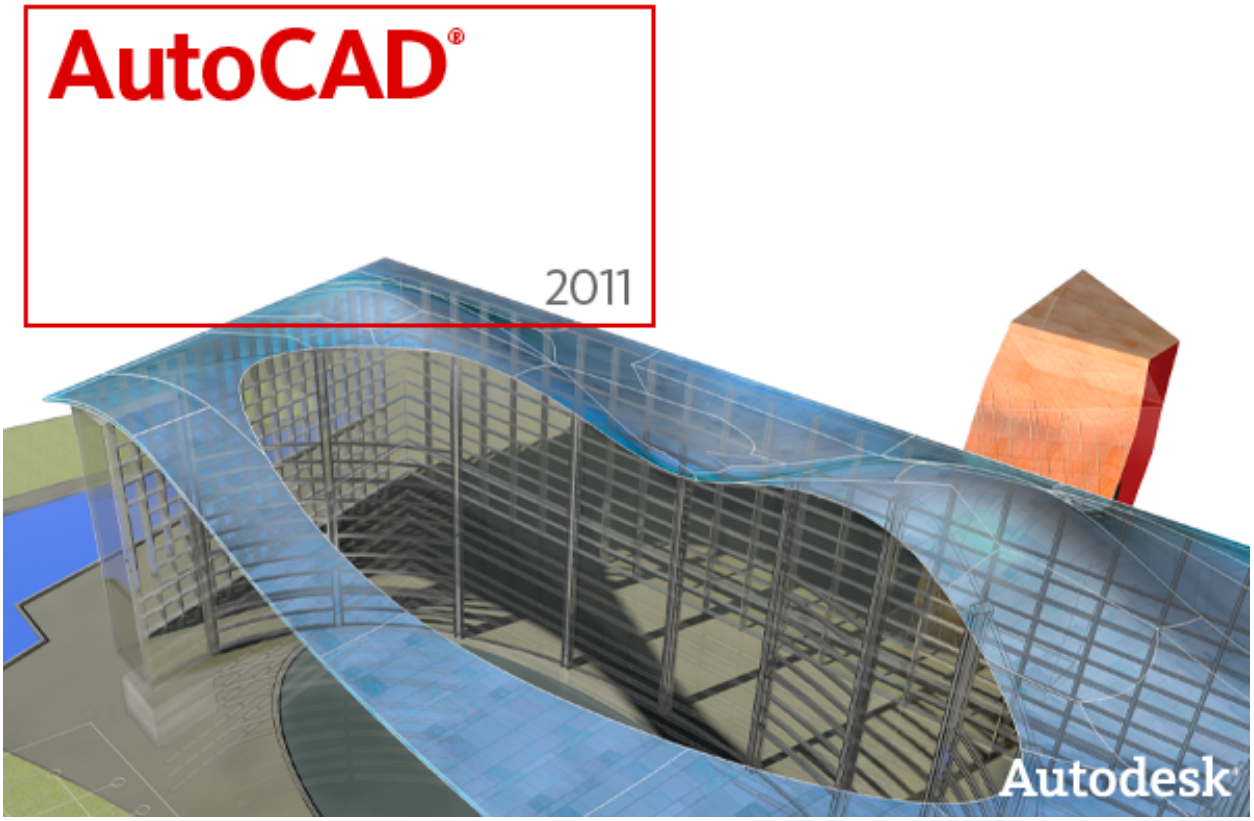
AutoCAD 2011 Preview Guide



Power your design projects from concept through completion with AutoCAD® 2011 software. Your ideas can take shape with greater clarity and accuracy than ever before, thanks to new surface modeling tools and point cloud support. New inferred constraints capabilities make working with parametrics easier, and updated productivity tools help you deliver final design documentation faster than ever. And major updates to materials and surfaces help you communicate design intent with the impact you demand. With these and many other new capabilities you've been asking for, AutoCAD 2011 helps you take design and documentation further.

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User Interface

AutoCAD 2011 offers a variety of user interface enhancements that allow you to design with greater ease and efficiency.

Drawing Window

The drawing window has been updated in AutoCAD 2011 to display a dark gray background in modelspace. You can easily modify the drawing window color from the Display tab of the Options dialog box.

The traditional dot grid has been replaced with horizontal and vertical gridlines to more closely represent engineering graph paper. When the grid is enabled, red and green lines extend from the UCS icon to represent the X and Y axes of the origin.

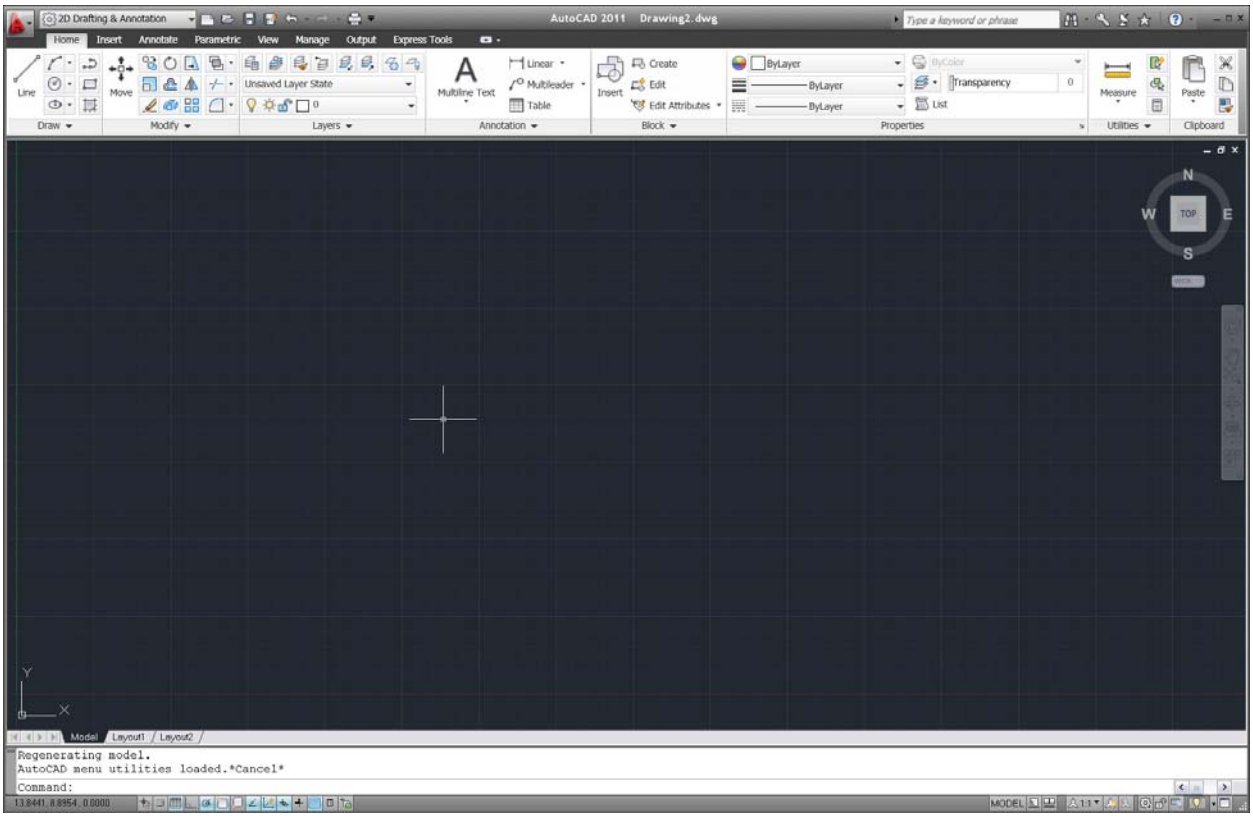


Figure 1. AutoCAD 2011 drawing window

Quick Access Toolbar

The Quick Access toolbar displays the name of the current workspace. You can easily select a different workspace and access other workspace tools. In addition, the default Quick Access toolbar now includes both the Save and the Save As tools.

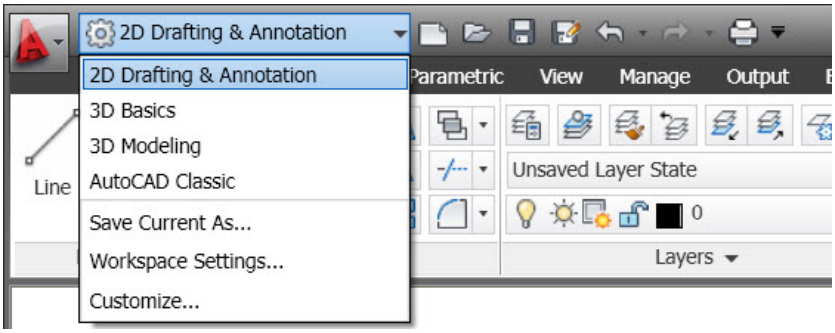


Figure 2. Workspace menu

Navigation

AutoCAD 2011 includes a new Navigation bar with frequently used navigation tools, including Autodesk® SteeringWheels®, ViewCube, and ShowMotion, as well as Pan, Zoom, and Orbit. It replaces the navigation tools that were previously accessible on the Status bar. You can control the display of the Navigation bar for individual workspaces via a property in the CUI dialog box.

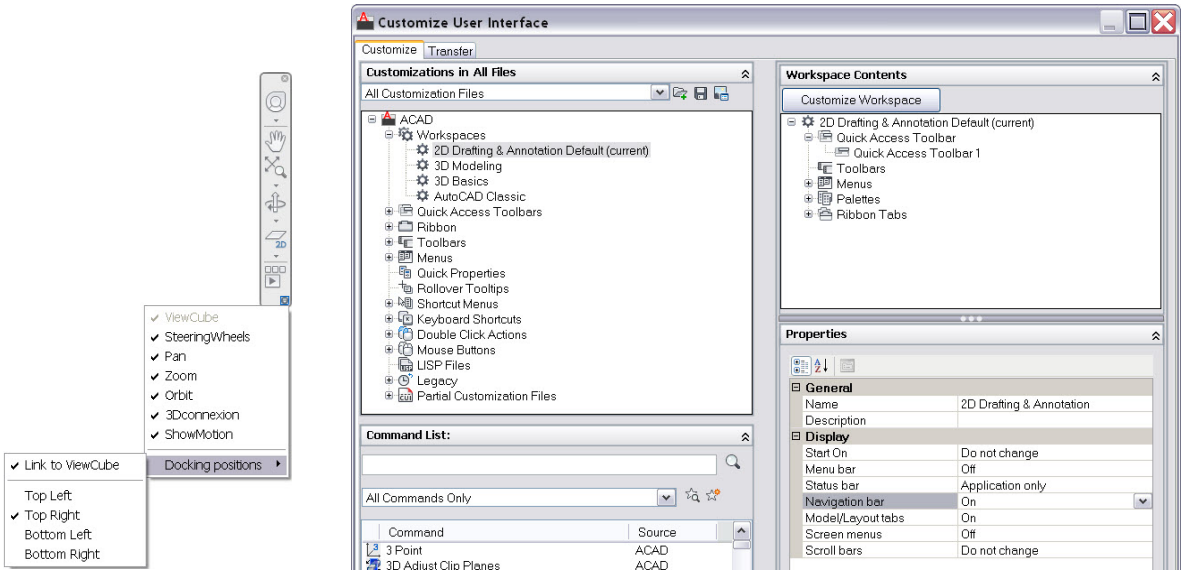


Figure 3. CUI Navigation bar property

The Navigation bar provides integrated support for 3D Connexion™ devices when the 3D Connexion system driver is present.

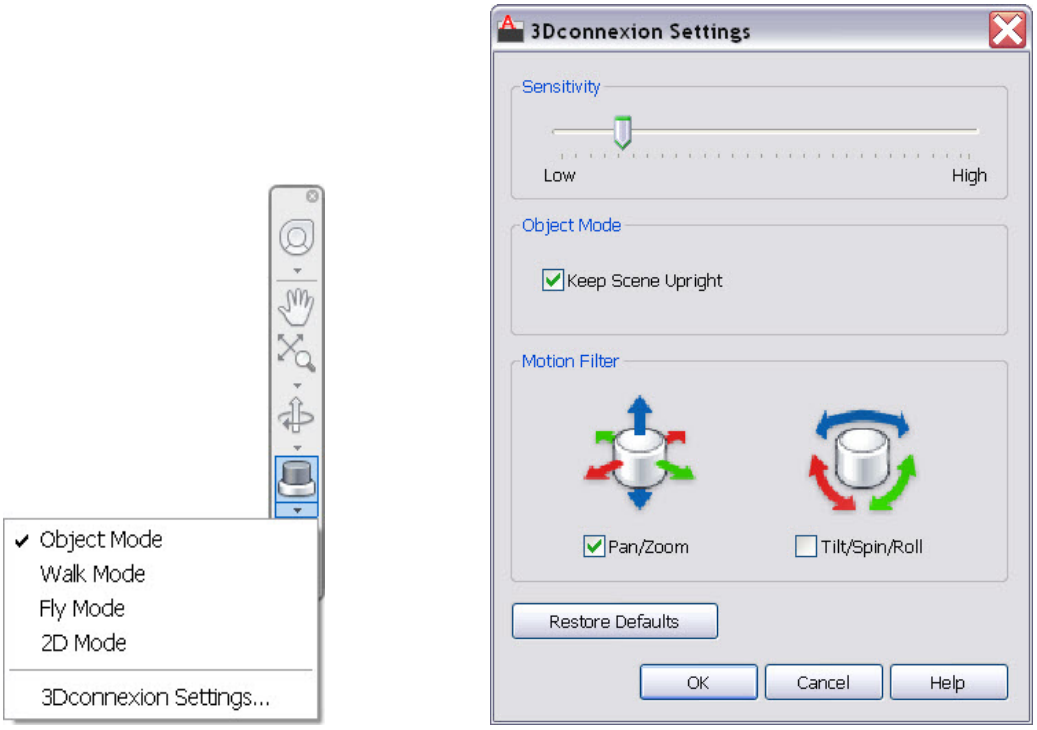


Figure 4. 3D Connexion settings

The ViewCube has been enhanced to support the 2D wireframe visual style, enabling you to easily change your viewpoint. The clockwise and counter-clockwise controls are particularly useful for rotating the viewpoint on the 2D plane.

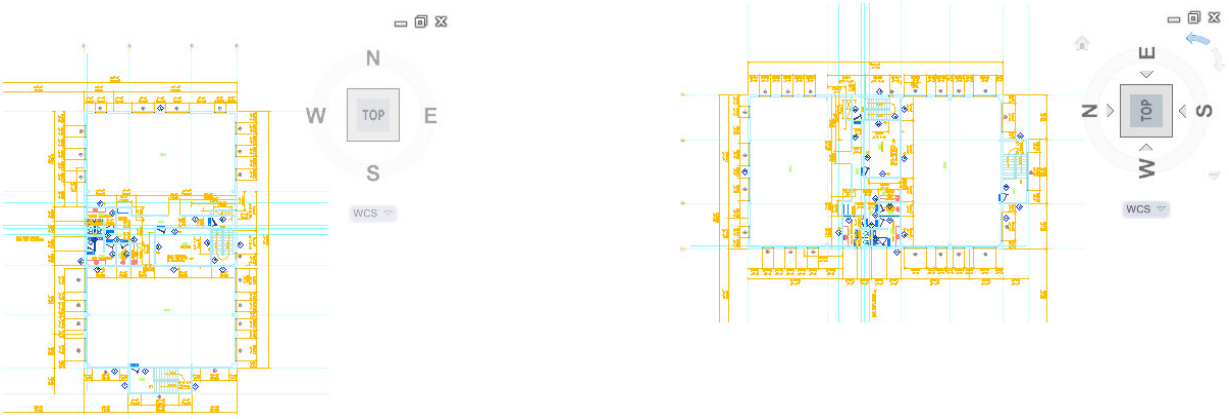


Figure 5. ViewCube navigation

The SteeringWheels Settings dialog box has been updated for clarity and consistency.

UCS Icon and 3D Gizmos

The UCS icon has been updated to display a different color for each axis: X for red, Y for green, and Z for blue. In addition, the appearance of 3D gizmos has been updated for clarity and consistency.

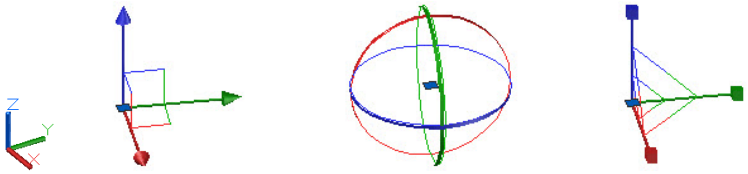


Figure 6. UCS icon and 3D gizmos

The Ribbon

A new pull-down menu has been added to the ribbon cycle button at the end of the list of tabs. You can minimize the ribbon to panel buttons, tabs, or panel titles.

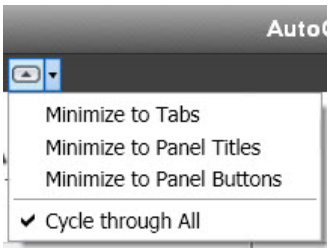


Figure 7. Ribbon cycle options

When you minimize the ribbon to panel buttons, large icons appear for each panel. Hovering over the button causes the panel to expand, similar to the behavior you see when the ribbon is minimized to panel titles.

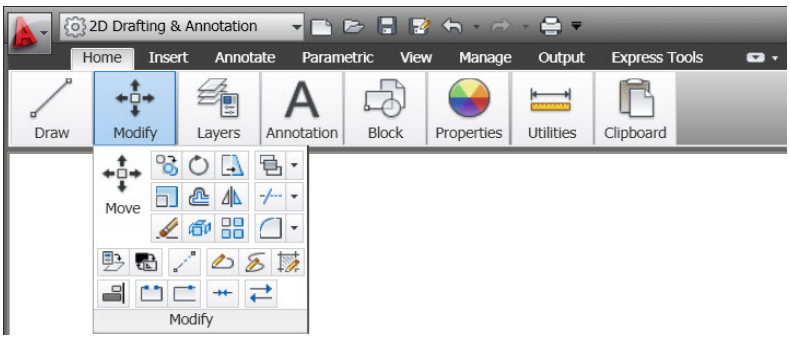


Figure 8. Ribbon panel buttons

The Insert tab includes a Point Cloud panel to support the new Point Cloud functionality. In addition, a new Content panel provides easy access to Design Center and Autodesk® Seek web service. Autodesk Seek has been removed from the Output tab.

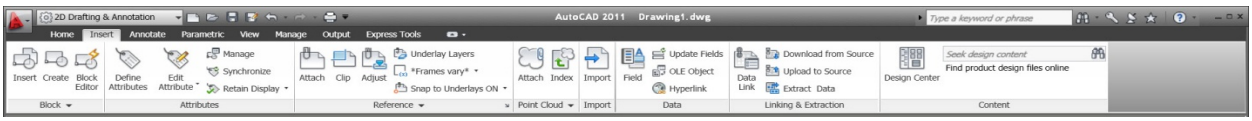


Figure 9. Insert tab

The View tab has been updated to include the Visual Styles panel, providing you with easy access to predefined visual styles, the Visual Styles Manager, and other visual styles controls. The Windows panel includes new User Interface and Toolbar controls that enable you to easily toggle the display of various user interface elements, including Autodesk® ViewCube® and ShowMotion® navigation widgets, the Navigation bar, and the Text window. The Status bar controls, which have been removed from the Windows panel, are still easily accessible from the Status bar.

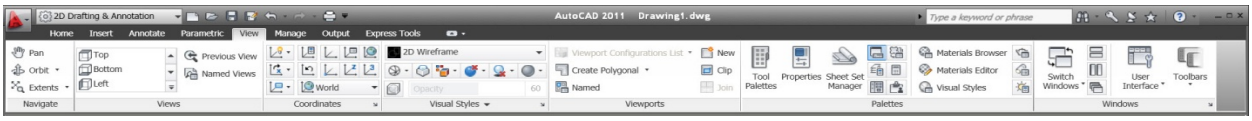


Figure 10. View tab

Customizable ribbon functionality in the Customize User Interface dialog box has been enhanced to include new Fold panels. As you change the size of your AutoCAD window or add and remove panels from a tab, Fold panels resize horizontally to fill the available space. Fold panel properties enable you to specify default, maximium, and minimum button sizes.

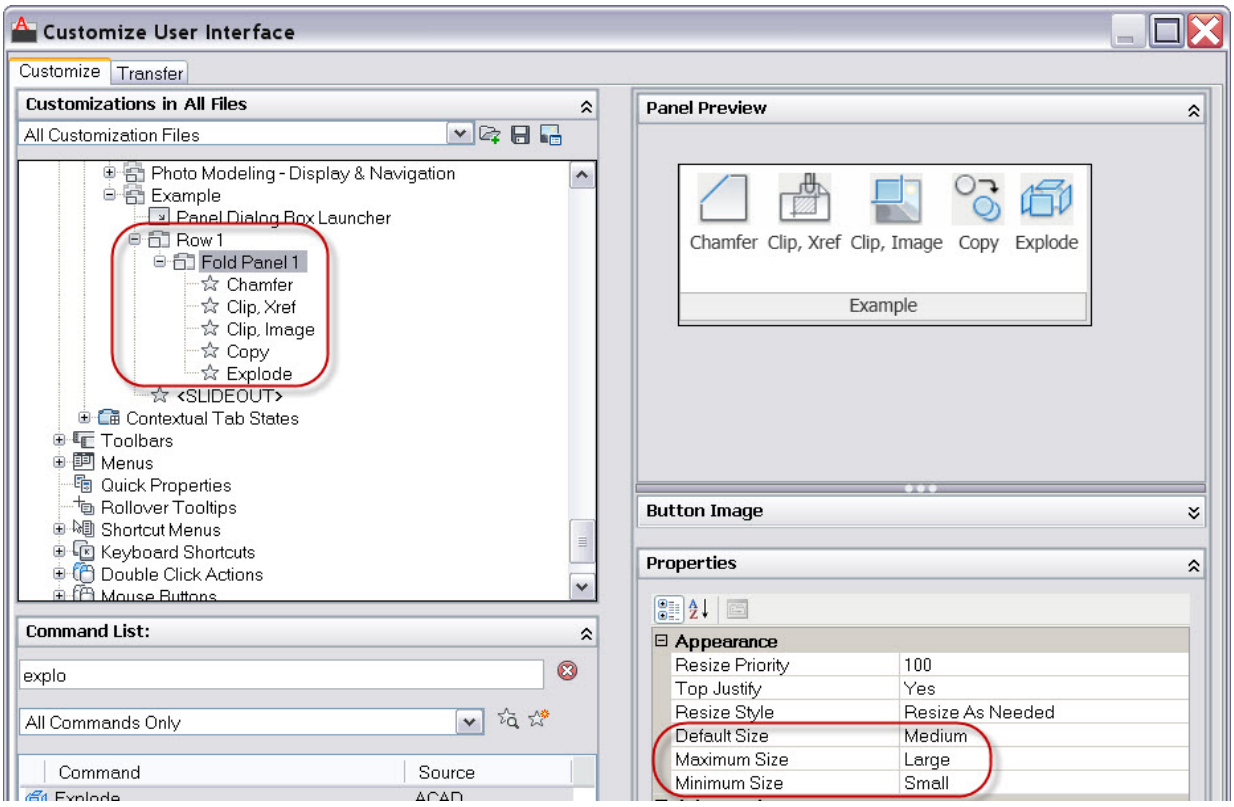


Figure 11. CUI Ribbon Fold Panel.

For example, the Fold panel defined above could have the following default, maximum, and minimum appearances.

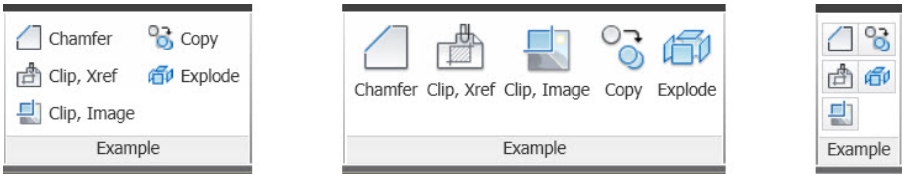


Figure 12. Example Fold panel

Visual Styles

AutoCAD 2011 provides five new predefined visual styles including: Shaded, Shaded with Edges, Shades of Gray, Sketchy, and X-Ray. With the most common combinations of visual style properties right at your fingertips, visual styles are easier to use than ever.

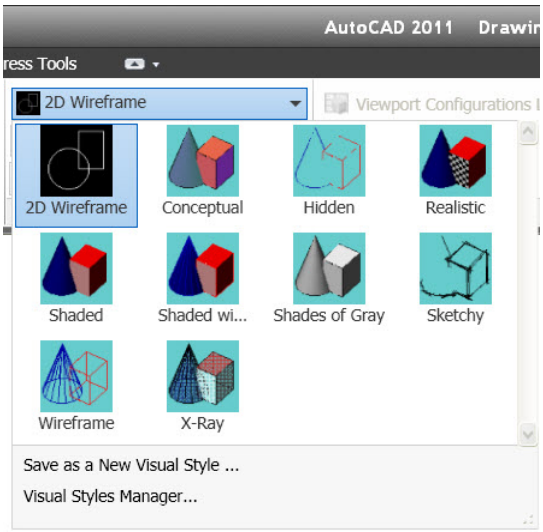


Figure 13. Visual styles

Object Visibility

AutoCAD 2011 includes new tools that enable you to control object visibility independent from layer visibility. The Object Visibility tools are accessible from the right-click menu when objects are selected as well as when no objects are selected. When you use the Isolate Objects tool, only the selected objects remain visible in the drawing. All other objects are hidden.

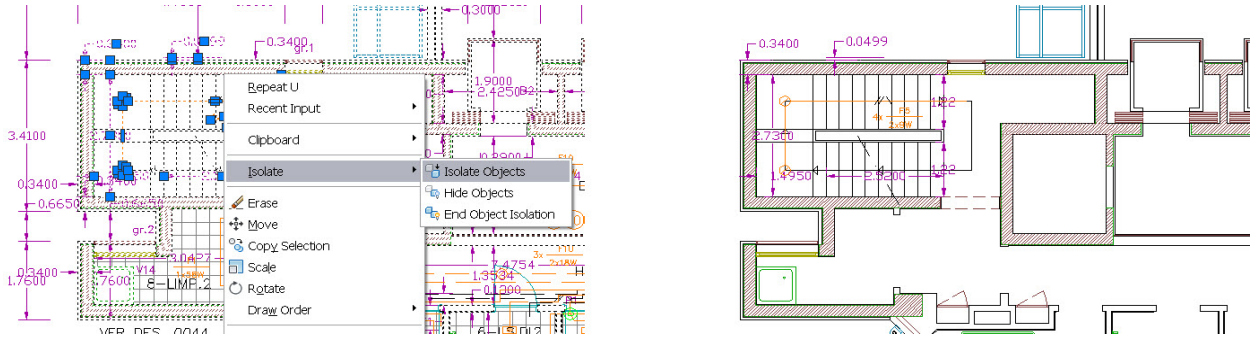


Figure 14. Isolated objects

Alternatively, when you use the Hide Objects tool, the selected objects are hidden.

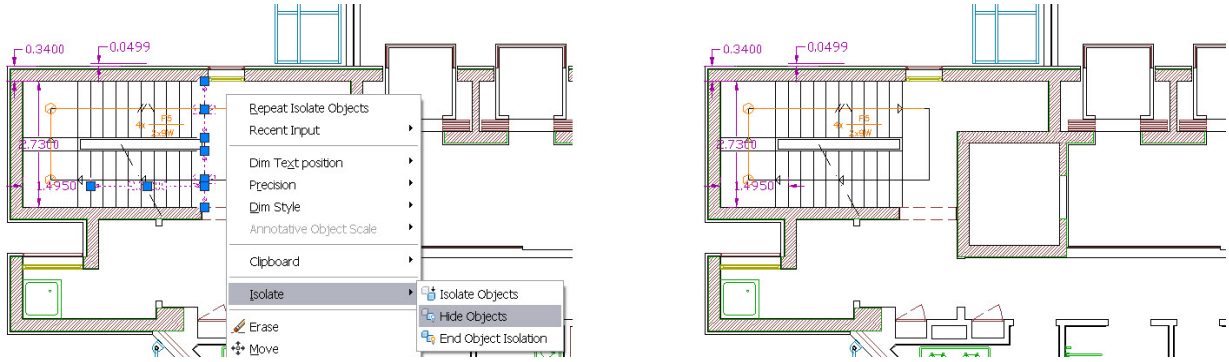


Figure 15. Hidden objects

You can use a combination of the Isolate Objects and Hide Objects tools to efficiently display only the objects that are relevant to your current task. For example, you might use the Isolate Objects tool to select an area of the drawing you want to edit and then use the Hide Objects tool to hide additional objects within that area. After completing your task, you can quickly restore the hidden objects using the End Object Isolation tool.

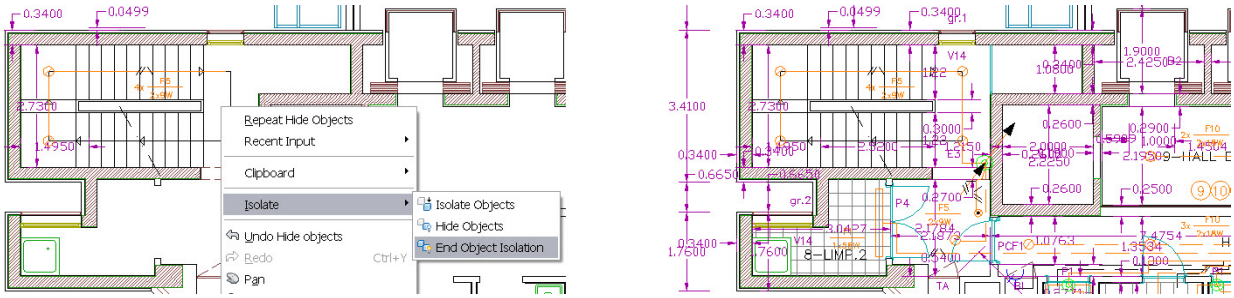


Figure 16. End Object Isolation tool

The OBJECTISOLATIONMODE system variable controls whether isolated/hidden objects persist between drawing sessions. A lightbulb icon on the status bar indicates whether object isolation is active in the drawing.

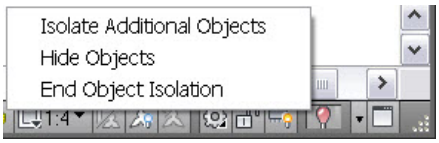


Figure 17. Object Isolation status icon

In addition to the obvious benefits object visibility controls offer for 2D design, they're just as valuable for 3D modeling.

Object Selection

The new Select Similar tool enables you to select an object and automatically include all other objects of the same type and with the same properties, in a new selection set. You can access it from the right-click menu when objects are selected.

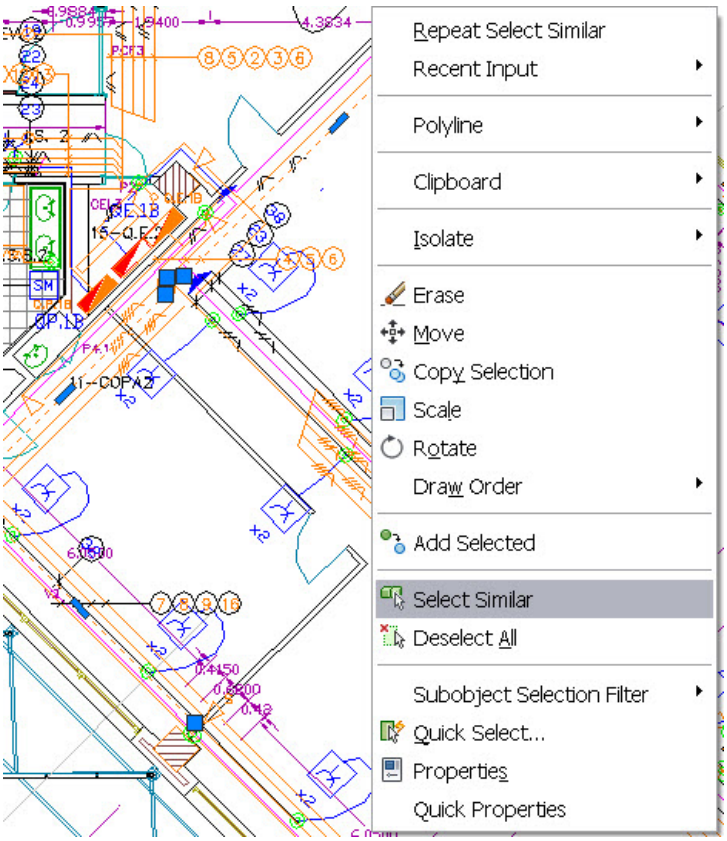


Figure 18. Select Similar tool

A Settings option (accessible when you enter SELECTSIMILAR at the command line) enables you to specify which properties to filter. If only the Layer property is enabled when you select a circle, for example, AutoCAD automatically selects all circles on the same layer as the one you selected. If both the Layer and Linetype properties are enabled, however, AutoCAD selects only the circles on the same layer *and* with the same linetype as the selected one.

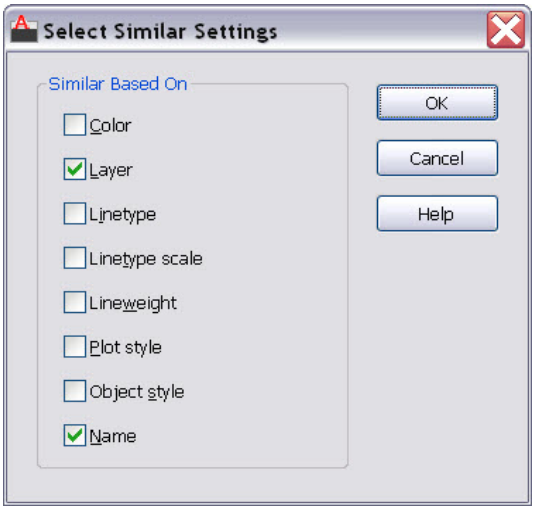


Figure 19. Select Similar Settings dialog box

The Select Similar tool also enables you to select more than one object and create the matching selection set accordingly. For example, if the Layer filter is enabled and you select two circles, each on different layers, AutoCAD selects all the circles on both layers. If, instead, you select a circle and a line, AutoCAD selects all the circles on the same layer as the selected circle and all the lines on the same layer as the selected line. In addition to general object properties, you can filter selections based on object-specific properties, including object style and reference name. Object Style properties apply to text and mtext, leaders and mleaders, dimensions and tolerances, and tables and multilines. Reference names apply to blocks and externally referenced files, including xrefs and images as well as PDF, DWG™, or DGN files.

In addition to the new Select Similar tool, a new option has been added to the PICKADD system variable. When PICKADD is set to a value of 2 (as it is now by default), objects that you select using the SELECT command remain selected in a “pick first” state even after you end the SELECT command.

Easily select overlapping objects using the new selection cycling functionality. You can enable selection cycling from a control on the Status bar. When you try to select an object that overlaps other objects, AutoCAD displays a list of all the overlapping objects. As you pass the cursor over an object in the list, the relevant object in the drawing highlights.

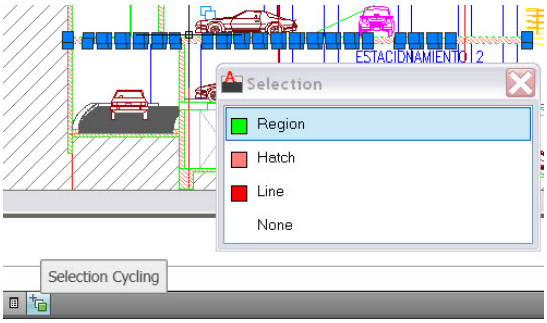


Figure 20. Selection cycling tool

Object Creation

The new Add Selected tool enables you to quickly create a new object in your drawing based on the properties of an existing object. For example, if you use the Add Selected tool and select a polyline, AutoCAD automatically launches the PLINE command with basic object properties including color, layer, linetype, linetype scale, plotstyle, lineweight, transparency, and material preset to match the selected object.

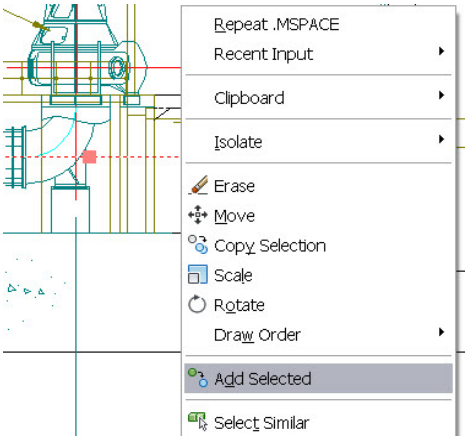


Figure 21. Add Selected tool

Action Recorder

The Action Macro enables you to delete or insert user messages for View Change operations.

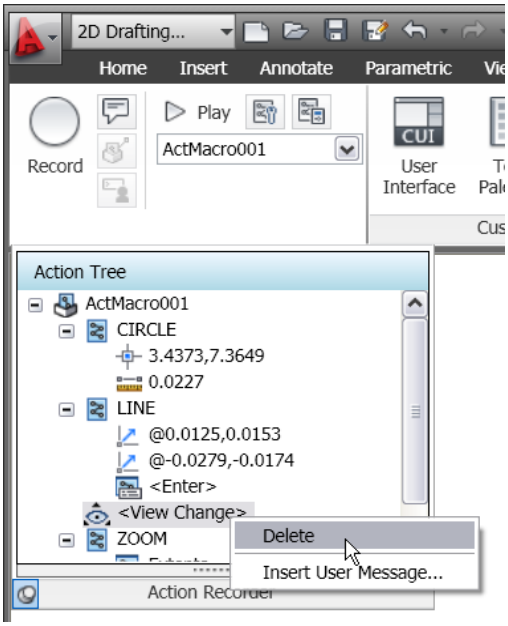


Figure 22. View Change editing tools

The macro list displays the most recently used macros above the separation bar and all available macros below it.

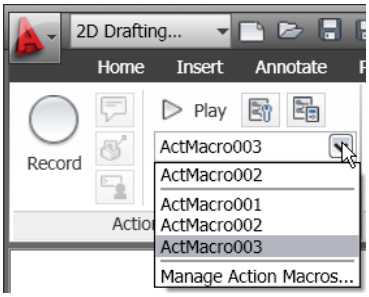


Figure 23. Action macro list

Document

AutoCAD is synonymous with documentation for good reason. Powerful documentation tools in AutoCAD 2011 help you work even faster with automation, management, and editing tools that minimize repetitive tasks and speed your time to completion. No matter your project's size or scope, you can meet the challenge with AutoCAD—continuously leading and innovating documentation for over 25 years.

Parametric Constraints

The 2D parametric functionality has been enhanced in AutoCAD 2011, and includes predefined command macros to access options within in the GEOMCONSTRAINT and DIMCONSTRAINT commands. For example, instead of launching the GEOMCONSTRAINT command and then selecting the Perpendicular option, you can launch the GCPERPENDICULAR command directly. Repeating the last command automatically repeats the last command as well as the specific option.

Object highlighting when you roll over an icon on a constraint bar or when you select a parameter in the Parameters manager supports the Visual Effects settings you specify on the Selection tab of the Options dialog box (dashed and thickened by default). Additional improvements to geometric and dimensional constraint functionality enable you to create and edit parametrically constrained geometry faster than ever before.

Geometric Constraints

AutoCAD 2011 significantly simplifies the process of adding geometric constraints to 2D AutoCAD geometry. AutoCAD can infer geometric constraints as you create and modify geometry. A new Infer Constraint button on the status bar enables you to toggle inferred constraints on and off similar to toggling object snaps on and off. This toggle is also available on the Geometric tab of the Constraint Settings dialog box.

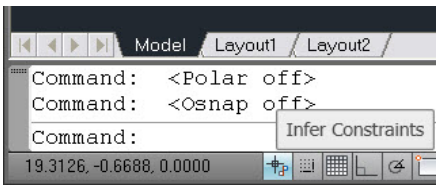


Figure 24. Infer Constraints tool

Using inferred constraints automatically applies coincident constraints for Endpoint, Midpoint, Center, Node, and Insertion objects snaps. For example, if you draw a circle by snapping its center to the midpoint of a line, AutoCAD automatically applies a coincident constraint between the center of the circle and the midpoint of the line. If you move the circle, the line goes with it. The same powerful functionality applies to editing commands. If, for example, you copy the insertion of a block to the endpoint of a line, AutoCAD automatically applies a coincident constraint between those two points. When you move the line, the block maintains its position at the endpoint of the line.

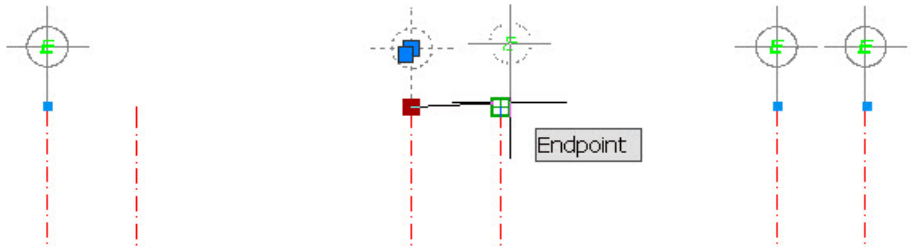


Figure 25. Editing with inferred constraints

In addition to creating point-to-point coincident constraints with the previously mentioned object snaps, you can use the Nearest object snap to apply a coincident constraint between a point and an object. For example, if you draw the center of a circle on a line using the Nearest object snap, the center of the circle has the flexibility of moving anywhere along the line including the virtual extension of the line.

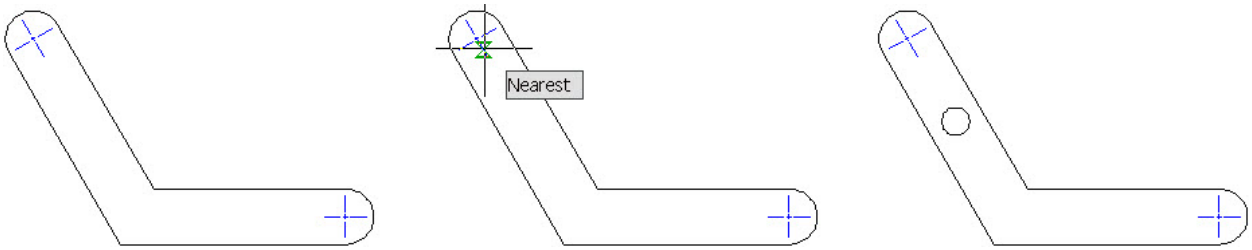


Figure 26. Nearest object snap with inferred constraints

The Perpendicular and Tangent object snaps automatically apply perpendicular or tangent constraints between the object being created or edited and the object being snapped to. They also apply a point-to-point or point-to-object coincident constraint if appropriate. Using the Parallel object snap automatically applies a parallel constraint but no coincident constraints are applied since, by definition, the two objects never intersect. When you draw horizontal or vertical lines and polyline segments, inferred horizontal and vertical constraints automatically apply to those segments.

Inferred constraints enhance the behavior of rectangles, fillets, and chamfers by automatically applying appropriate geometric constraints. For example, if you draw a rectangle (using the RECTANG command), AutoCAD automatically applies a pair of parallel constraints and a perpendicular constraint to the closed polyline. When you modify the size and shape of the rectangle, you can rest assured that it will remain a rectangle with parallel sides and perpendicular corners. Creating a fillet automatically applies coincident and tangent constraints between the newly created arc and the existing pair of lines helping maintain

the fillet even when the arc or lines are modified. Similarly, creating a chamfer applies coincident constraints between the newly created line and the existing pair of lines.

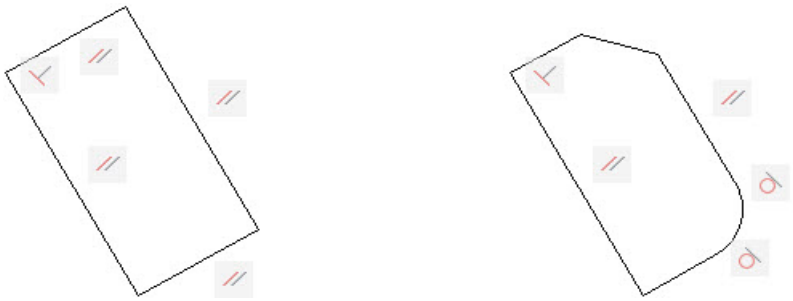


Figure 27. Fillets and chamfers with inferred constraints

Even after you've applied constraints, you can temporarily relax them by pressing the CTRL key while editing constrained objects.

AutoCAD 2011 improves the support of geometric constraints for ellipses and text. You can now apply Parallel, Perpendicular, Collinear, Horizontal, and Vertical constraints between the major or minor axes of an ellipse and other objects.

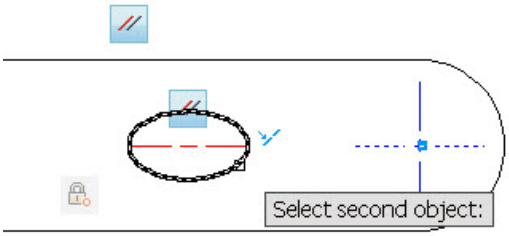


Figure 28. Constraining an ellipse

Similarly, you can apply Parallel, Perpendicular, Collinear, Horizontal, and Vertical constraints to the rotation angle of text objects. In addition, text and mtext objects behave consistently and predictably, with the identified insertion point of the object being the constrainable point.

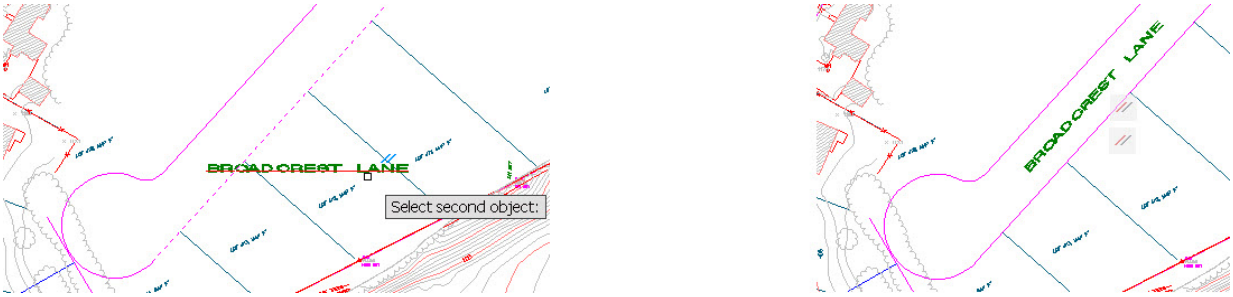


Figure 29. Constraining text

The AutoConstrain functionality in AutoCAD 2011 has been updated to include the Equal constraint. When you use AutoConstrain with the Equal option enabled, the Equal constraint is automatically applied to lines and polyline segments of equal length and arcs and/or circles of equal radius.

Constraint bars are enhanced to provide more control and flexibility. You can select multiple objects for showing or hiding constraint bars using standard selection methods, including Window, Crossing, Fence, and Implied Window/Crossing. Quickly display all constraint bars in their original position using the new Reset option. And, a new setting in the Geometric tab of the Constraint Settings dialogs enables you to show constraint bars when objects are selected even if those constraint bars are currently hidden. When the geometry is no longer selected, the temporarily displayed constraint bars are, once again, hidden. When you move a constraint bar and then edit the related geometry, the constraint bar maintains its position relative to the geometry.

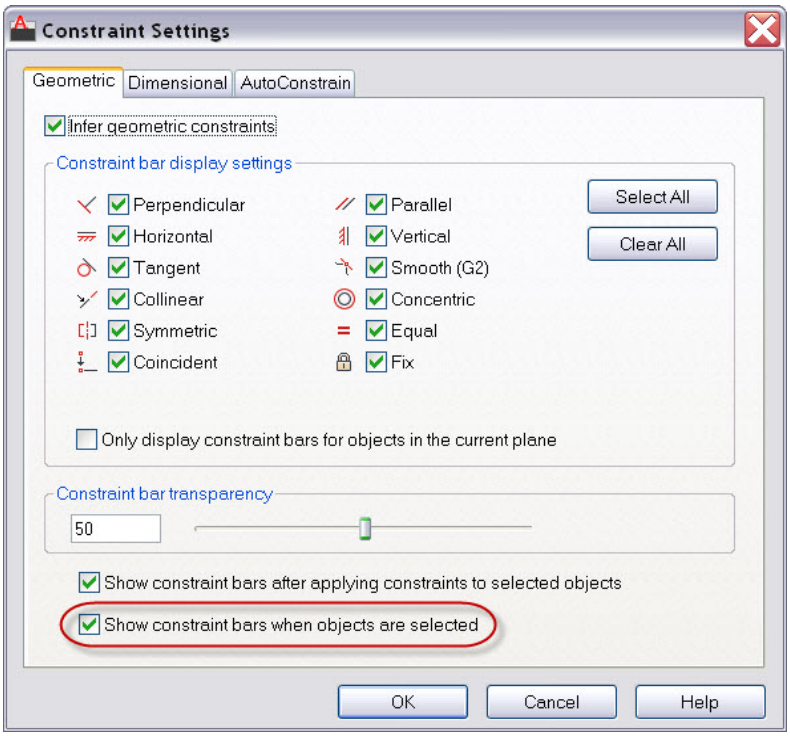


Figure 30. Geometric Constraint settings

The new constraint icons for Fix, Horizontal, and Vertical constraints visually indicate whether they apply to an object or to a point. The symmetric constraint icon is also updated to indicate whether it is identifying a symmetrical point or object, or the symmetric line.

Constraint	Icons	Description
Fix		Different icons for fix point and fix object constraints
Horizontal		Different icons for fix point and fix object constraints
Vertical		Different icons for fix point and fix object constraints
Symmetric		Different icons for symmetrical point, object, and symmetry line

Dimensional Constraints

The DIMCONSTRAINT command includes a new Convert option to convert associative dimensions to dimensional constraints rather than it being the default behavior.

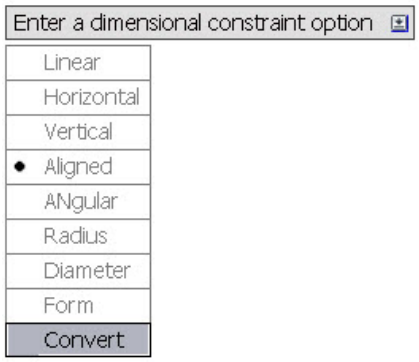


Figure 31. DIMCONSTRAINT options

When entering dimensional constraint values in-place, you can click on an existing dimensional constraint to insert the constraint name. When dynamic dimensional constraints reference another parameter, the parameter text is prepended with "fx:" to help prevent you from accidentally assigning a constant value to a parameter that references other variables.

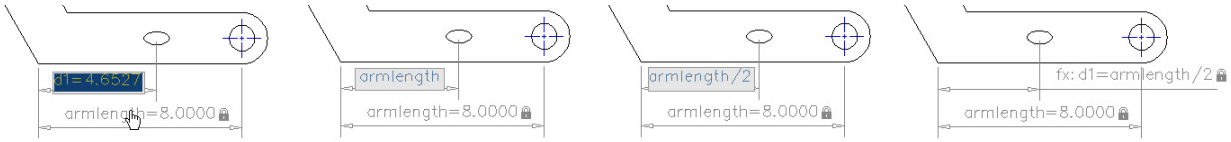


Figure 32. Dimensional constraints

New tools on the Dimensional Panel of the Parametric tab provide you with more control over the display of dimensional constraints. Using the Show/Hide tool you can select the specific dimensional constraints you want to show or hide.

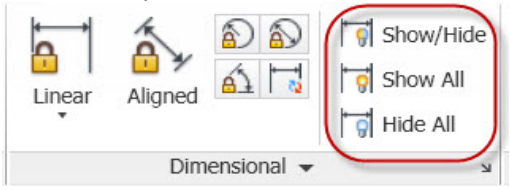


Figure 33. Dimensional constraint visibility tools

The Parameters Manager offers significant improvements in AutoCAD 2011. It includes a new Filters pane where you can define parameter groups that display a subset of the parameters. Create new filter groups using the button at the top of the Parameters Manager or by selecting the option from the right-click menu. With your filter groups created, you can then drag parameters into them. The right-click menu for parameters in the Parameters Manager is updated with additional options including the ability to display the Filter tree and to remove parameters from a group.

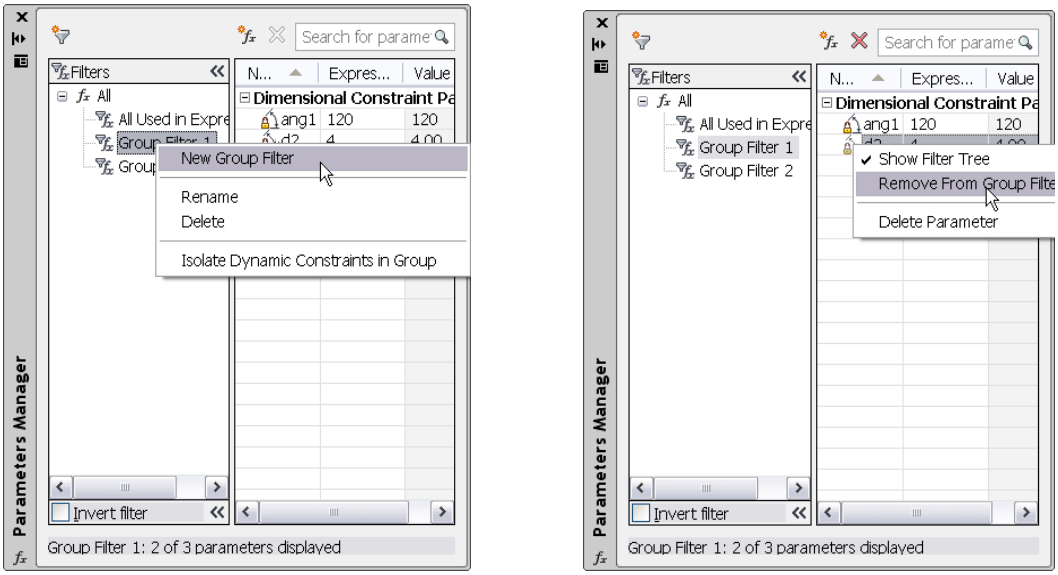


Figure 34. Parameter group filters

A new search box filters the parameters displayed in the grid control based on the parameter name. Column tooltips display the full name of the column as well as a description.

Additional enhancements to the Parameters Manager simplify the terminology for dimensional constraints and user variables created in the drawing editor versus the block editor. The Show column in the Block Editor includes a new option to convert between dimensional constraint parameters or user parameters defined in the drawing editor versus the block editor. In the Block Editor, icons are displayed for action parameters, attributes, and user parameters.

Transparency

AutoCAD 2011 includes a new transparency property that enables you to apply transparency to objects and layers in the same way you apply colors, linetypes, and lineweights.

Figure 35. Transparent objects

You can set transparency by layer, by block, or individually for an object. The default transparency value for layers and objects is 0, and you can set it as high as 90.

The Layer Properties Manager (palette and dialog), the Layer States Manager, the Layer Filter dialog, and the Layer Translator have all been updated to reflect the new transparency property. In the Layer Properties Manager, a new column for Transparency is available in modelspace and layouts, and a column for Viewport (VP) Transparency is available in layouts and floating modelspace viewports.

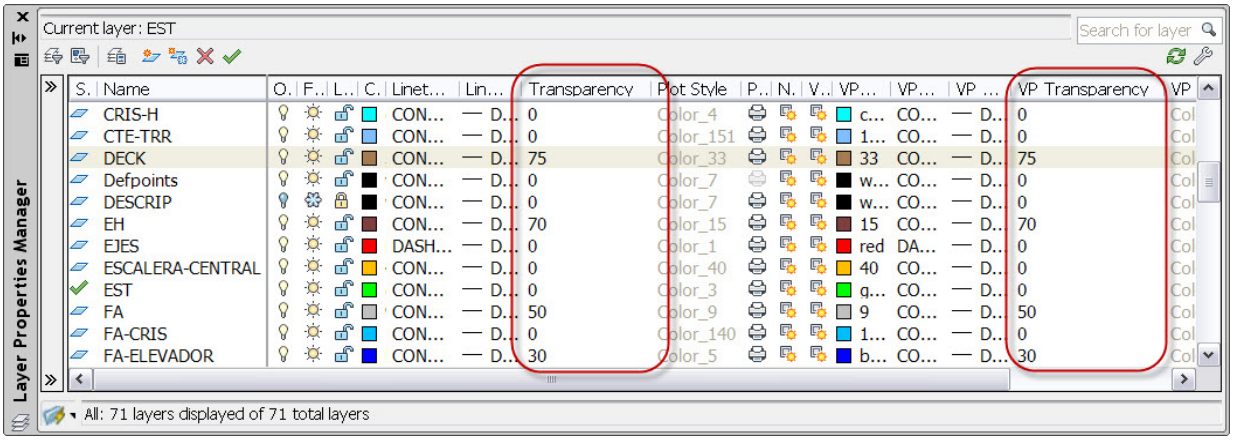


Figure 36. Layer Transparancy options

You can set transparency for individual objects just like color and linetype. Setting a transparency value for an individual object overrides the layer transparency setting for that object. You can access object transparency from a number of places: the Properties palette, Quick Properties, or the ribbon. The new CETRANSPARENCY system variable sets the transparency property for new objects.

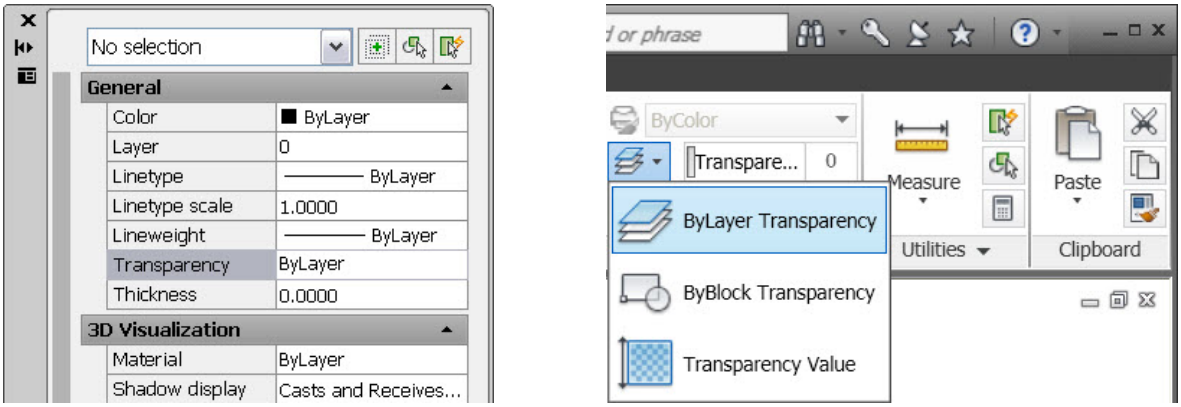


Figure 37. Object Transparancy options

The SetByLayer Settings dialog has been updated to include Transparency as one of the available properties.

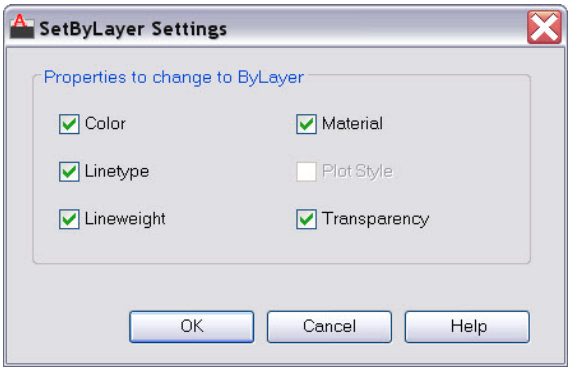


Figure 38. SetByLayer settings

Transparency has also been added to the Quick Select, Filter, and Match Property Settings dialogs as well as the CHPROP, CHANGE, -LAYER, VPLAYER, and LIST commands.

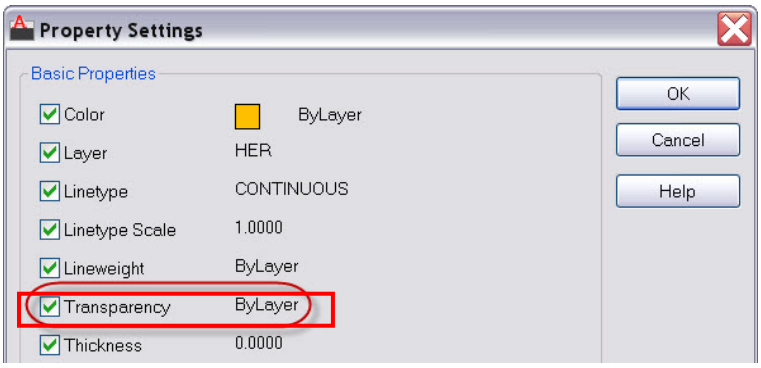


Figure 39. Property settings

A button has been added to the status bar to enable you to temporarily turn off transparency display (TRANSPARENCYDISPLAY system variable), similar to the behavior of the lineweight display button. This does not affect plotting. However, you have the option to turn off transparency when plotting. The Plot

and Page Setup dialogs both include a checkbox for transparency (PLOTTRANSPARENCY), similar to the behavior for plot styles. When this option is enabled, AutoCAD rasterizes the entire drawing for plotting, slowing down the plotting process.

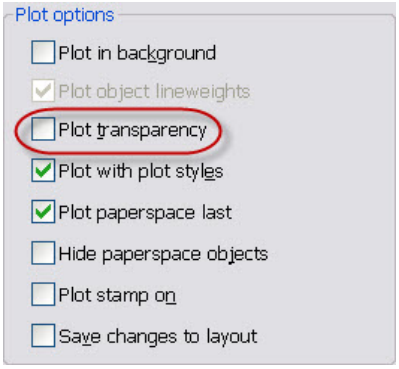


Figure 40. Plot transparency

Prior to AutoCAD 2011, images had a setting, also called “transparency,” that controlled whether the background of a bitonal image was clear or opaque. This property has been renamed to “background transparency” to distinguish it from the new “transparency” property. You can apply both background and object transparencies to images in AutoCAD 2011.

Hatches and Gradients

The Hatch tool is streamlined in AutoCAD 2011 for faster creation and editing of hatch objects. It now immediately prompts you to select an internal point without displaying the Hatch dialog box. Instead, the new Hatch Creation contextual tab provides easy access to all hatch and gradient options.

Figure 41. Hatch Creation tab

A Hatch Editor contextual ribbon displays similar hatch tools when you select an existing hatch.

Figure 42. Hatch Editing ribbon tab

The Hatch Preview function for the “pick points” method has been improved. Now, passing your cursor over an eligible area shows you what the hatch would look like if you clicked there.

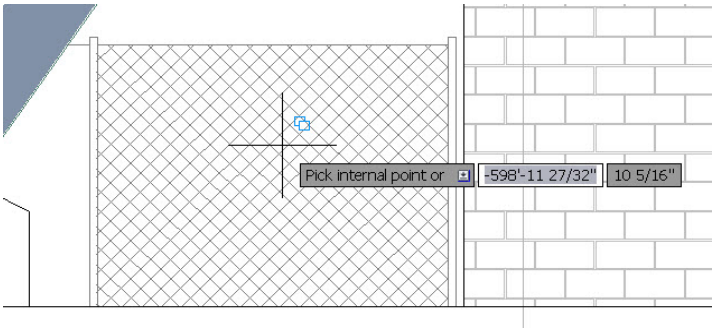


Figure 43. Hatch preview

You can also see the result of each click as you pick points or objects in the drawing. Keep in mind that even though it looks as though a hatch was created as you clicked, it will not actually be a separate object unless you have the “Create Separate Hatches” option on.

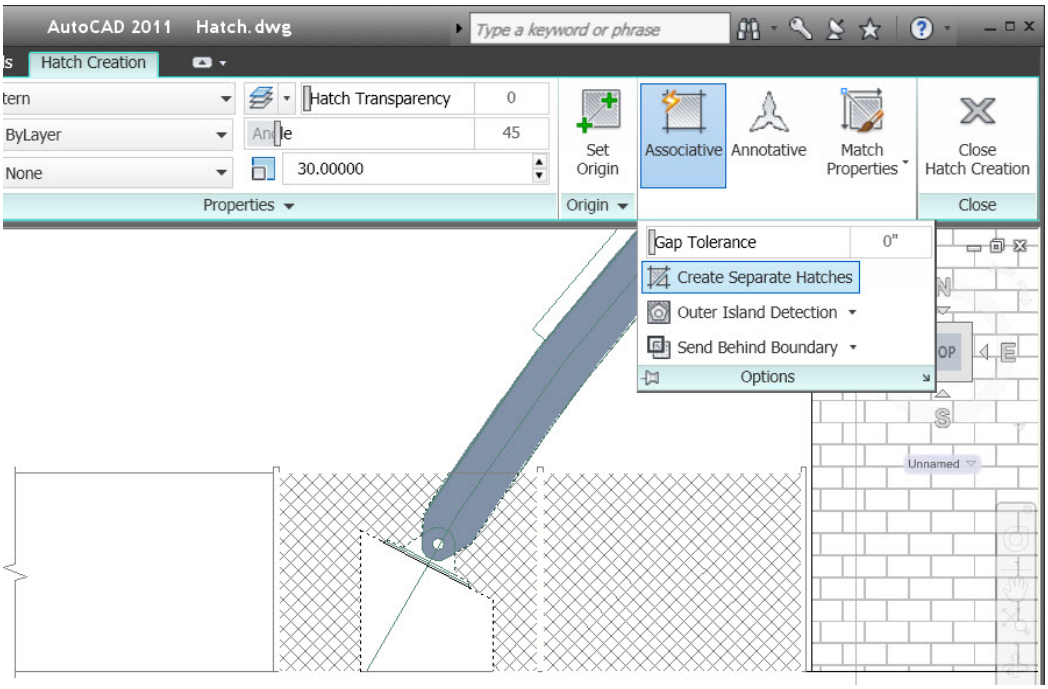


Figure 44. Create Separate Hatches option

AutoCAD 2011 continues to expand object grip functionality with a new center grip for direct manipulation of hatch objects. You can use direct manipulation to stretch or move the hatch or change the origin, angle, or scale. These options are available when you hover over the grip. You can either choose an option from the list, or activate the grip and use CTRL to cycle through the different behaviors.

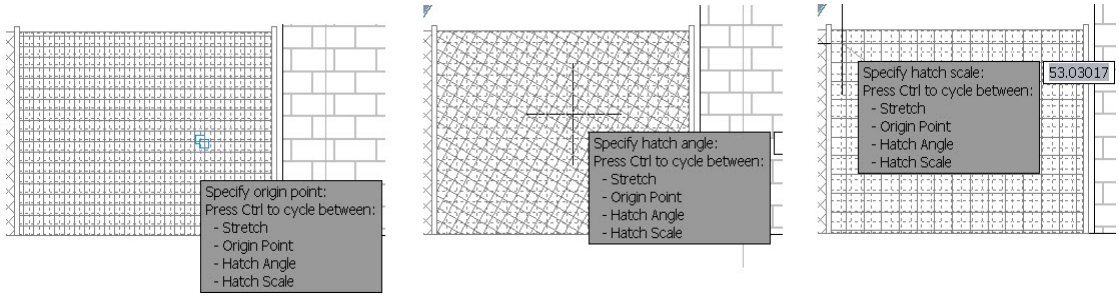


Figure 45. Direct manipulation hatch tools

Other hatch grip behavior has not changed, except that "stretch" is now the default action for the secondary or middle grips on a nonassociative hatch.

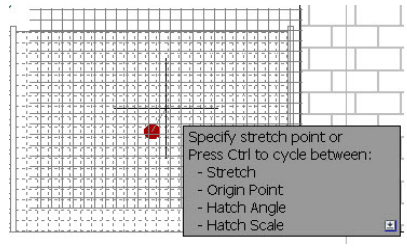


Figure 46. Stretch hatch action

Hatches now support background color in addition to line color. This enables you to have the effect of layering hatches in one object.

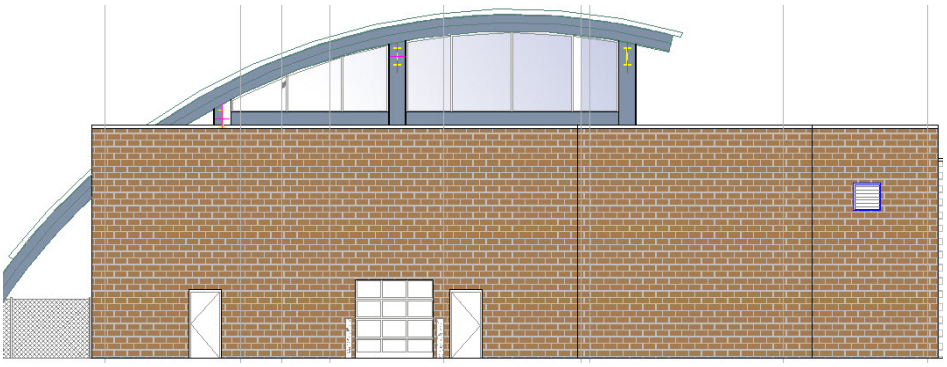


Figure 47. Hatch background color

You now also have the option to set a hatch's layer before you create it. You can choose either to use the current layer or to pick one from your drawing. Like color, pattern, and other hatch properties, layer is a persistent setting during your drawing session.

The command HATCHTOBACK has been introduced in response to an item on the AUGI wishlist. Similar to TEXTTOFRONT, HATCHTOBACK sends hatches underneath all other objects in the drawing. "Send Hatches to Back" is available on the Modify panel of the Home tab under the Draw Order flyout, along with "Bring Text to Front" and "Bring Dimensions to Front."

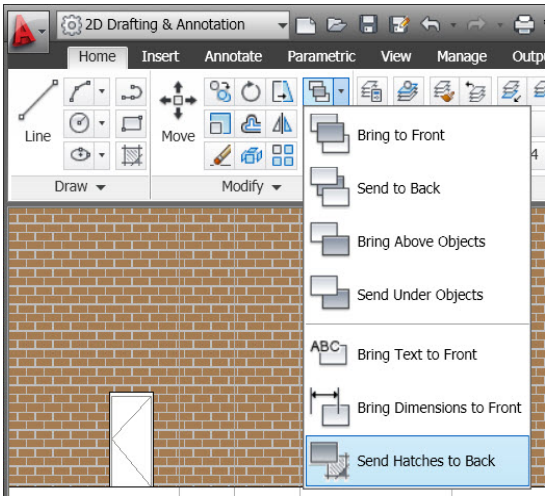


Figure 48. Send Hatches to Back tool

The new system variable MIRRHATCH enables you to mirror hatches while retaining their orientation. (This is similar to the MIRRTEXT variable.) Set to 0, mirroring hatches maintains their original angle. When MIRRHATCH is set to 1, the hatch angle mirrors along with the rest of the objects.

Figure 49. Hatch mirror behavior

The Hatch Object Limit system variable (HPOBJWARNING) has been increased to 10,000 from 1,000 to reflect the capabilities of current computers. When a large number of objects are selected for hatch boundary calculations, it can result in slower performance. Thanks to increased hardware capabilities, though, it now takes a much larger number of boundary objects to affect calculation speed. You may now also set the value of the Hatch Object Limit yourself.

Polylines

Polyline objects in AutoCAD 2011 now have extra grips to make editing them easier than ever. In addition to the familiar primary grips located at the end of each polyline segment, there are now additional secondary grips located at the midpoint of each segment. These grips, like the new hatch grips, are multifunctional. The available functions can be seen by hovering over a grip, and you can choose an option directly from the menu that appears.

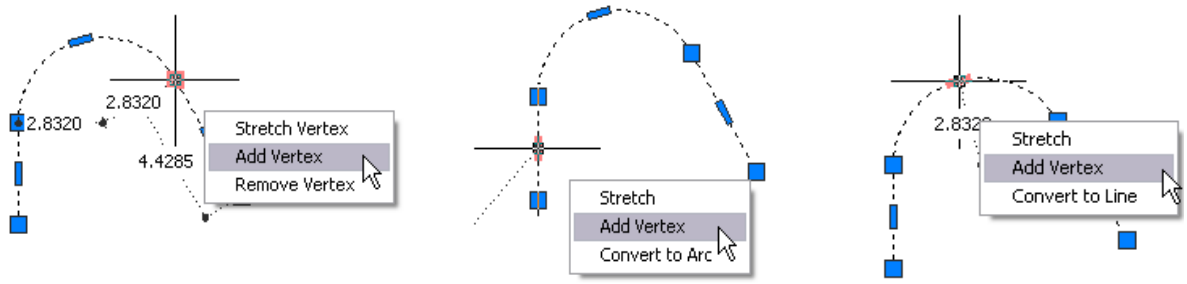


Figure 50. Direct manipulation polyline tools

You can also activate the grip by clicking on it. Then you can cycle through the available functions by pressing CTRL, or choosing one of the options from the right-click menu. Icons next to the cursor indicate the active function.

Sub-selection for polylines has been refined in AutoCAD 2011. To sub-select one or more segments of a polyline, hold down CTRL while left-clicking on the polyline.

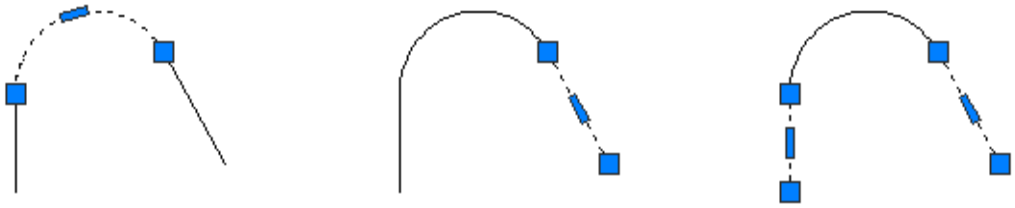


Figure 51. Polyline sub-object selection

Grip behavior for sub-selected segments is identical to the behavior when the entire polyline is selected.

You can now use the JOIN command to connect lines, arcs, and polylines to 3D polylines, as long as they are all contiguous (in other words, they share a common endpoint). You must select the most complex object first (in this case, the 3D polyline), and the objects to be joined do *not* need to be coplanar.

Splines

Splines have been updated in AutoCAD 2011 to provide more flexibility and control. You can define a spline using fit points or control vertices (CV). CV splines are more appropriate if you will be using them with 3D NURBS surfaces.

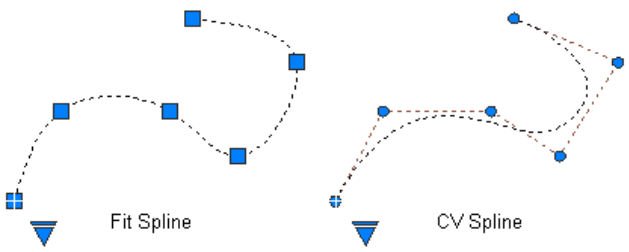


Figure 52. Fit spline and Control Vertices spline

When drawing a fit spline, you can specify additional settings for its start and end tangencies, tolerance (how close the spline must come to the fit point), and knot parameterization (controlling the shape of the curve as it passes through the fit point).

The only option for CV splines is Degree, which controls how many bends the spline can take in a given span.

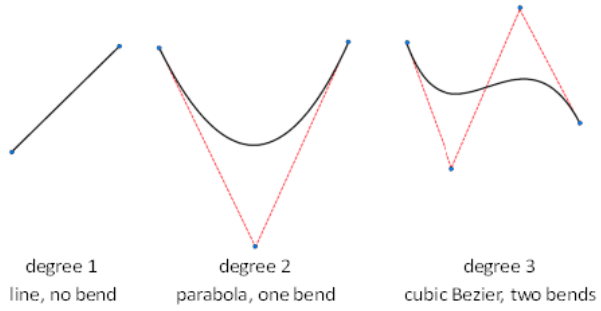


Figure 53. CV spline Degree C

Easily switch methods, add and remove points, or edit endpoint tangencies using intuitive grip menus.

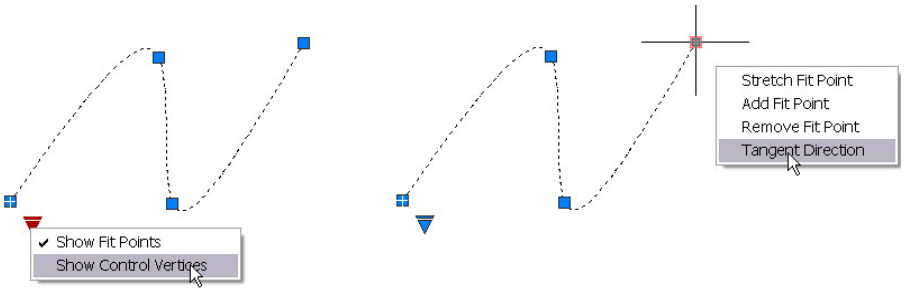


Figure 54. Spline tangent direction

The SPLINEDIT command also has several new options, including improved Edit Vertex options. You can now easily add “kinks” or sharp corners to a spline.

Figure 55. Spline kink

You can use the JOIN command to connect lines, arcs, polylines, 3D polylines, and helixes to splines, as long as they are all contiguous (in other words, they share a common endpoint). You must select the most complex object first (in this case, the spline), and the objects to be joined do *not* need to be coplanar.

External References

The selection of externally referenced files has been enhanced in AutoCAD 2011. When you select a reference object in the drawing (xrefs, images, DWF™, DGN, PDF, data extraction tables), the corresponding reference is selected in the External References palette. Similarly, if you select file references from the External References palette, the references are highlighted (but not selected) in the drawing, assuming they are visible in the current view. You can control this behavior with the new ERHIGHLIGHT system variable.

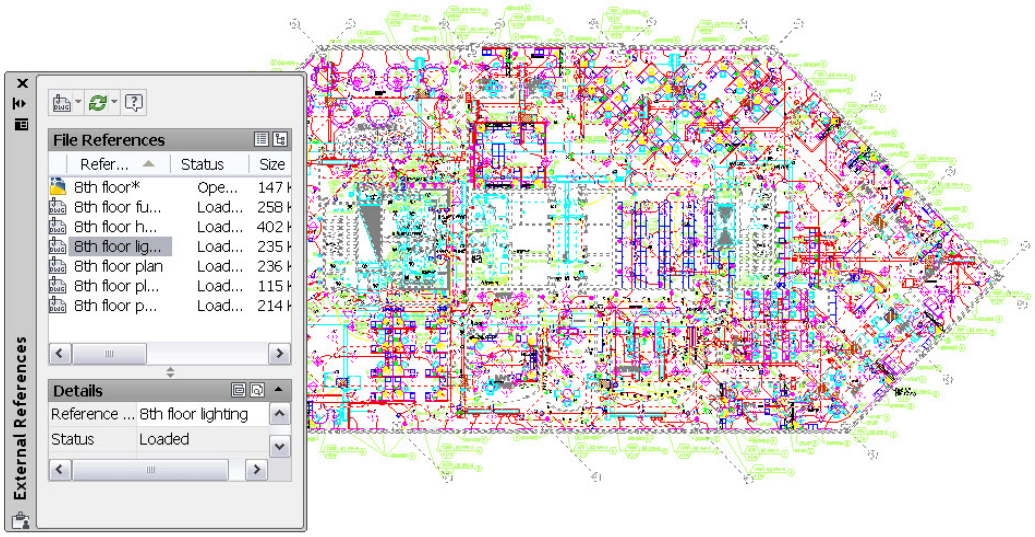


Figure 56. External Reference highlighting

The External References palette includes a option to easily detach data extraction tables from a drawing.

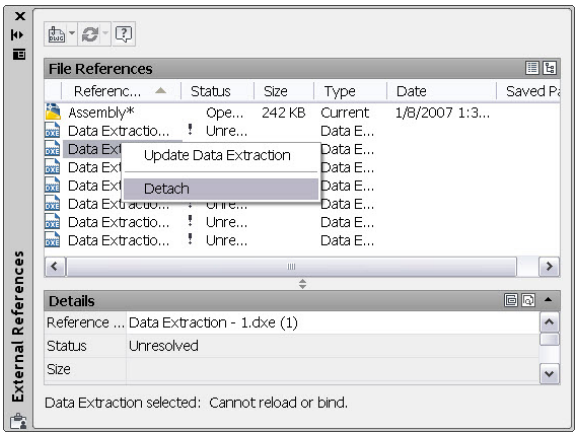


Figure 57. Data Extraction Table Detach option

Scale Lists

Scale list functionality has been enhanced in AutoCAD 2011 to store a customizable default list of annotation scales in the fixed profile of the registry. You can use the default scale list to define a customized list of scales that automatically displays in all your drawings. A scale list is still maintained in the drawing, but you can easily reset the scale list in the drawing to the default list of scales (metric or

imperial) defined in the registry. When the scale list in a drawing is reset, AutoCAD purges the unused scales in the drawing and then merges in the customized list of scales from the registry into the drawing. You can customize the Default Scale List from the User Preferences Tab of the Options dialog box. You can still edit the scale list stored in the drawing by accessing the scale control on the Status bar or with the SCALELISTEDIT command.

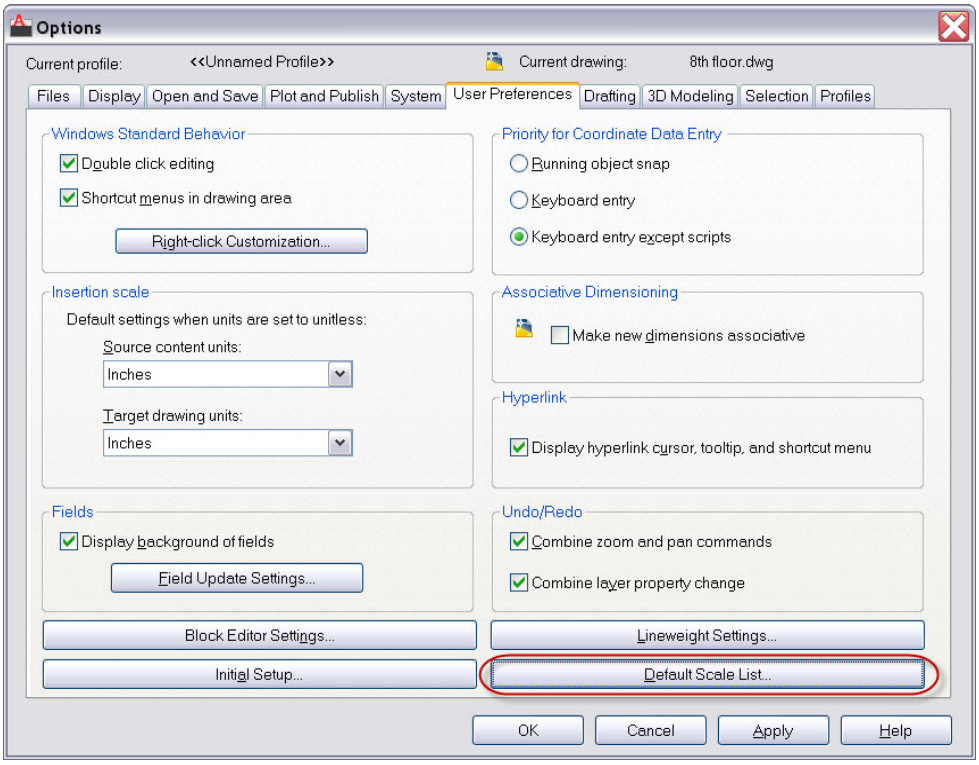


Figure 58. User Preferences tab of the Options dialog box

The Default Scale List dialog box is similar to the existing Edit Scale List dialog, which edits the scales in the drawing. However, the Default Scale List dialog box includes additional controls for you to specify whether the default scales are metric or imperial.

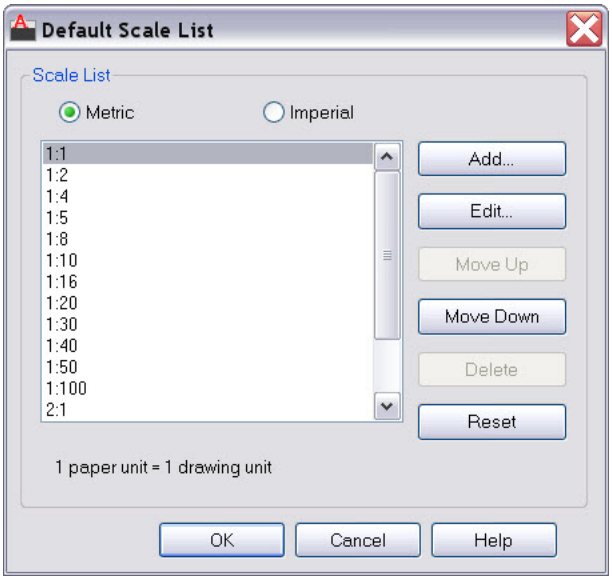


Figure 59. Default Scale list

When you reset the scales list in a drawing, you are prompted to select Metric scales, Imperial scales, or both. The default choice is governed by the MEASUREMENT variable in the drawing. When you create a new drawing without specifying a template, AutoCAD adds metric or imperial scales based on the MEASUREMENT variable. When you create a new drawing based on a template, the scales in the template appear in the new drawing. The scales in the registry are not imported.

Missing SHX and Font Files

You now have the option to ignore missing SHX files (shape or font files) when opening a drawing. You are no longer required to specify a replacement. This dialog may be suppressed if FONTALT is set to something other than “none.”

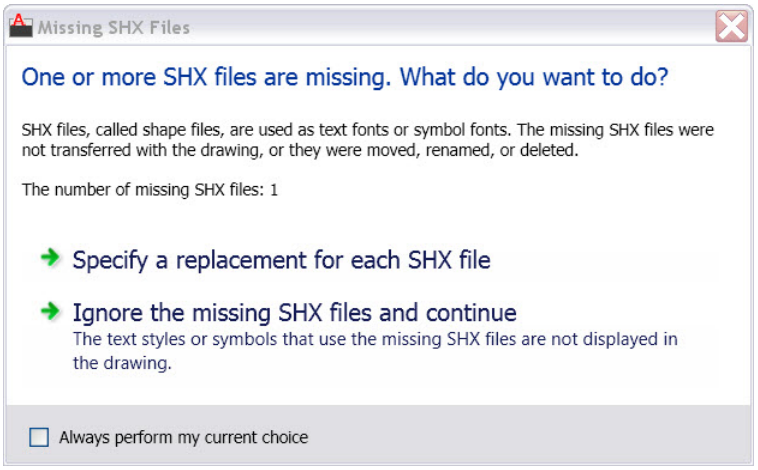


Figure 60. Missing SHX files

Text styles with missing fonts are now identified by an icon in the Text Style Manager.

Text Alignment in Linetypes

AutoCAD 2011 now makes it possible to maintain linetype readability in any orientation.

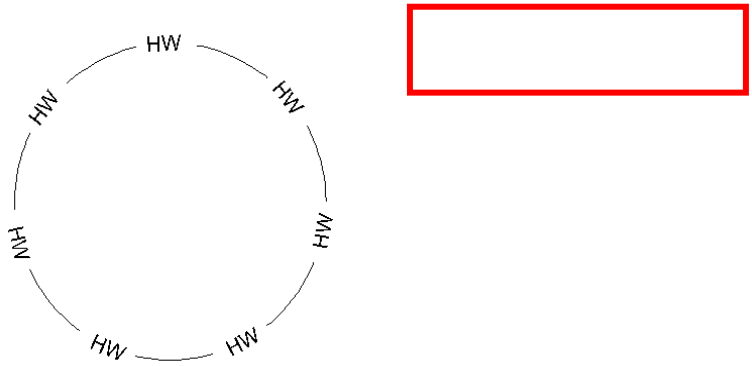


Figure 61. Text alignment

The linetypes included with AutoCAD 2011 behave this way by default. To update your own custom linetypes, you need to change the rotation option to U, for “upright”. (Other possible values for the rotation option are R, for “relative,” and A, for “absolute.”)

An example linetype definition looks like this:

Old:

```
*GAS_LINE,Gas line ----GAS----GAS----GAS----GAS----GAS----GAS--
A,.5,-.2,["GAS",STANDARD,S=.1,R=0.0,X=-0.1,Y=-.05],-.25
```

New:

```
*GAS_LINE,Gas line ----GAS----GAS----GAS----GAS----GAS----GAS--
A,.5,-.2,["GAS",STANDARD,S=.1,U=0.0,X=-0.1,Y=-.05],-.25
```

Figure 62. Example Linetype Definition.

Explore

AutoCAD 2011 gives you 3D power to explore your ideas in almost any shape imaginable. AutoCAD and a blank canvas have a lot in common. Both give you the ability to create the previously unimaginable. But AutoCAD provides the flexibility to explore design ideas in both 2D and 3D, with intuitive tools that help your concepts become real. The world is your canvas—what will you create next?

3D Modeling Workspaces

AutoCAD 2011 includes two 3D-related workspaces, which you can access from the Workspace menu in the Quick Access Toolbar. The 3D Basics workspace provides a simple workspace with the most basic tools for creating and visualizing 3D solid models. The 3D Modeling workspace provides access to the complete array of 3D tools in AutoCAD.

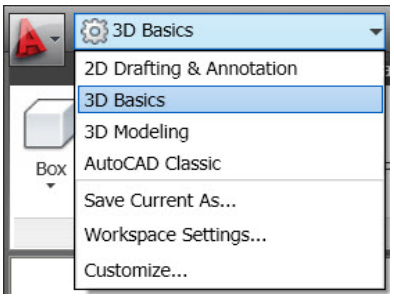


Figure 63. Workspaces list

3D Object Snaps

New tools and variables in AutoCAD 2011 separate 3D object snaps from 2D object snaps. A new 3D Object Snap toggle is available on the status bar, enabling you to toggle 3D object snaps on and off. Right-clicking on the status bar icon provides access to a menu of the 3D object snaps and the Settings option, which links to the new 3D Object Snap tab in the Drafting Settings dialog box. You can also access these controls via the shift-right-click menu, or at the command line using the new 3DOSNAP command and 3DOSMODE system variable.

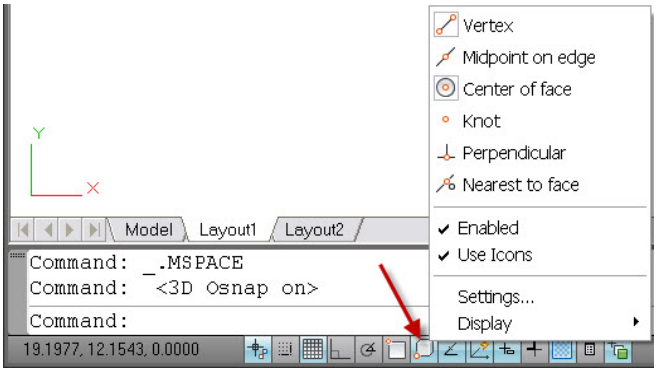


Figure 64. 3D Object snaps

Solid Modeling

3D modeling tools in AutoCAD 2011 have been updated to provide more flexibility and increased ease of use. The EXTRUDE, LOFT, REVOLVE, and SWEEP commands now allow you to select an edge or sub-object for using as a profile or curve to create a new surface. You are no longer limited to using planar curves.

The Solid ribbon tab provides access to new Fillet Edge and Chamfer Edge solid editing tools. Both of these tools provide a preview prior to completing the operation and they support direct manipulation.

Surface Modeling

In addition to 3D solid and mesh objects, AutoCAD 2011 offers two different types of surfaces: procedural and NURBS (non-uniform rational b-spline). Procedural surfaces are associative and have history. NURBS surfaces are not associative and do not have history. Instead, they have control vertices that allow you to sculpt shapes in a way that is closer to how you would operate in the real world. You can use procedural surfaces to take advantage of associative modeling and use NURBS surfaces to take advantage of sculpting with control vertices. A typical surface modeling workflow might be:

- Create a model that combines 3D solids, surfaces, and mesh objects.
- Convert the model to procedural surfaces to take advantage of associative modeling.
- Convert the procedural surfaces to a NURBS model with the CONVTONURBS command to take advantage of NURBS editing.
- Check for imperfections and wrinkles with the surface analysis tools.
- If necessary, rebuild the surfaces to restore smoothness with the CVREBUILD command.

The new Surface tab on the ribbon provides easy access to surface modeling tools.

Figure 65. Surface ribbon tab

Surface Creation Tools

AutoCAD 2011 enables you to create three new analytic surface types: Blend, Patch, and Network.

A blend surface creates a smooth transition between existing surfaces using the new SURFBLEND command. You can specify how the blend surface flows at the edge that meets and touches the other surfaces using the grip menu options.

Figure 66. Blended surface

The new Patch surface tool enables you to close or “patch” an open, closed-edge object. It generates a new patch surface for any bounding edge that is a closed loop.

Figure 67. Patch surface

The new Network tool enables you to create a surface through a set of curves in the U and V directions. It is similar to the LOFT command but more streamlined and flexible. You can even choose a selection of curves that are not connected to one another.

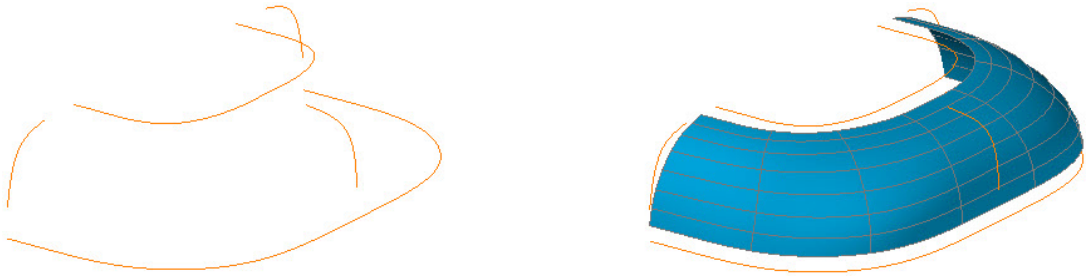


Figure 68. Network surface

If you define the edges of a networked surface using edges from existing surfaces, the newly created surface will have additional grips enabling you to control the continuity condition between the newly created surface and its adjacent surfaces.

The offset tool (SURFOFFSET command) is accessible from the Create panel of the Surface ribbon tab. It enables you to easily create a new surface by offsetting an existing surface.

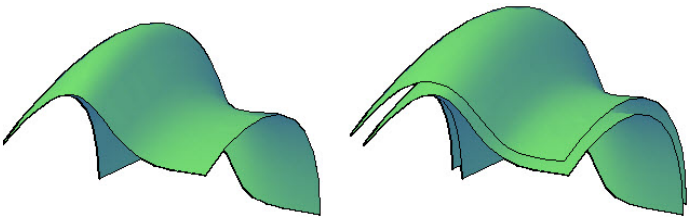


Figure 69. Offset surface

You can turn on Surface Associativity prior to performing a Blend, Patch, or Offset operation, accessible from the Create panel of the Surfaces ribbon tab, to constrain the new surfaces based on the originating surfaces. For example, if surface associativity is enabled when you create an offset surface and a blend between the two surfaces, all three surfaces are associative. If you edit the offset distance, using the Properties palette or grips, the blend surface will update accordingly.

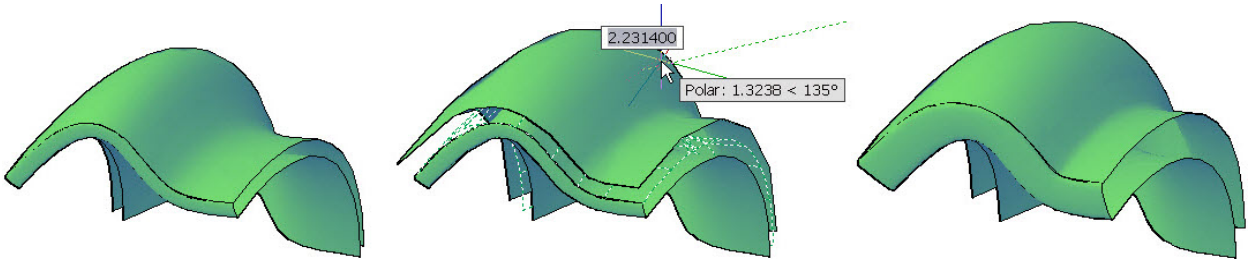


Figure 70. Surface associativity

Surface Editing Tools

AutoCAD 2011 offers a set of robust new surface editing tools to fillet, extend, trim, and untrim surfaces. You can create a fillet with a specified radius between two surface edges using the new Fillet tool (SURFFILLET command), available on the Edit panel.

Figure 71. Surface fillet

The new Trim tool, accessible from the Edit panel, enables you to create complex edges and holes in surfaces. You can use the Untrim tool (UNTRIM command) to untrim a trimmed surface.

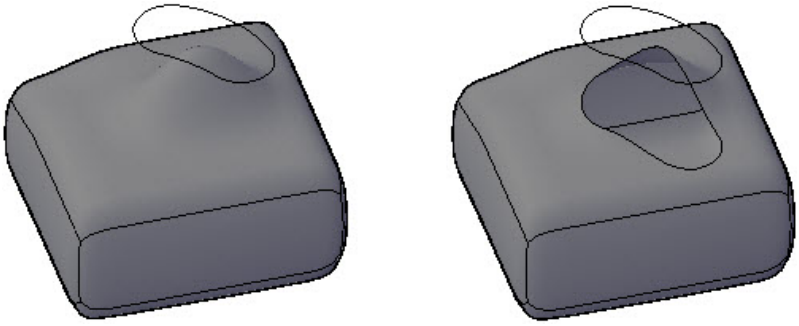


Figure 72. Surface trim

The new Extend tool (SURFEXTEND command), on the Edit panel, enables you to extend a surface by selecting an edge.

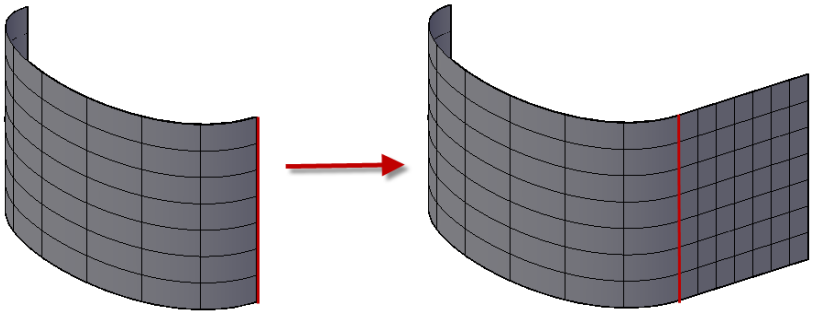


Figure 73. Surface extend

The new Sculpt tool (SURFSCULPT command), accessible from the Edit panel, enables you to create a new solid object based on the enclosed volume of multiple intersecting surfaces.

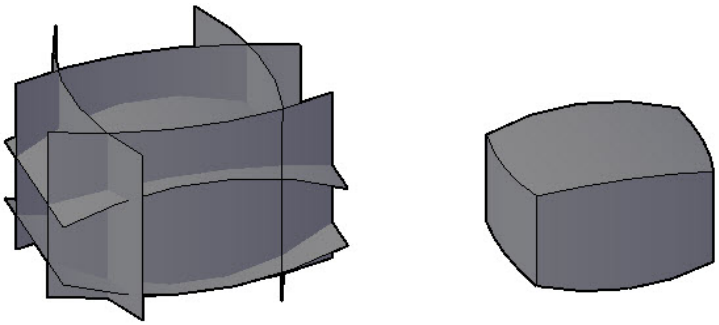


Figure 74. Surface sculpt

The new Project Geometry tools (PROJECTGEOMETRY command) enable you to project geometry onto a surface creating a new line or spline on top of the surface. Unlike the existing Imprint tool, the projected geometry is not consumed by the surface. You can use the AutoTrim tool to specify whether surfaces are automatically trimmed when you project geometry. All of these tools are available in the Project Geometry panel of the Surface ribbon tab.

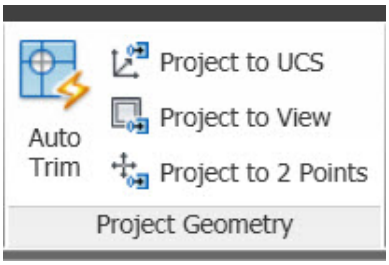


Figure 75. Project Geometry tools

You can convert from analytic surfaces to NURBS surfaces using the new Convert to NURBS tool (CONVTONURBS command) which is accessible from the Control Vertices panel on the Surface ribbon tab. Once an analytic surface is converted to a NURBS surface you can show/hide the control vertices via the Show CV and Hide CV tools (CVSHOW and CVHIDE commands) and use the gizmo to move the control vertices, reshaping the surface. Additional tools in the Control Vertices panel enable you to

rebuild the control vertices (CVREBUILD) or add (CVADD) and remove (CVREMOVE) vertices. The CV Edit Bar, located on the ribbon, is a convenient tool that combines the CVADD, CVHIDE, and CVREMOVE functions.

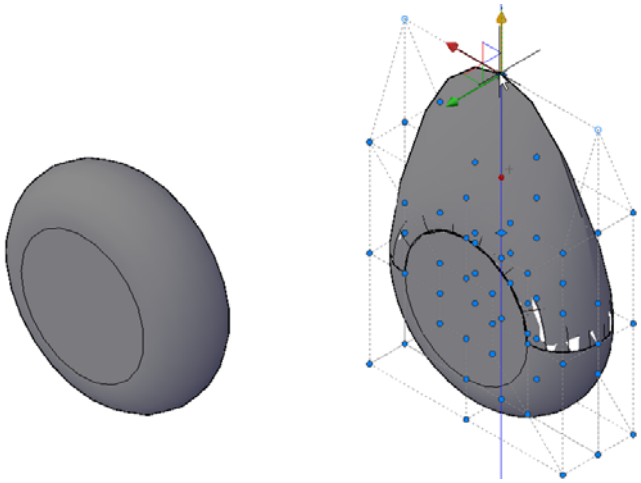


Figure 76. NURBS surface

Analysis Tools

AutoCAD 2011 provides a set of analysis tools to help you understand the continuity between different surfaces that make up a global shape. These tools are available in the Analysis panel of the Surface ribbon tab. The Zebra tool enables you to analyze surface continuity by projecting parallel lines onto the surface. The Curvature tool displays a color gradient on the surface, enabling you to identify high and low areas of curvature. The Draft tool displays a color gradient on the surface, enabling you to determine if a model has adequate draft between a part and its mold. You can control the display and behavior for each of the analysis tools using the Analysis Options dialog box. The Analysis Options dialog box is accessible from the Analysis panel as well as from the 3D Modeling tab of the Options dialog box.

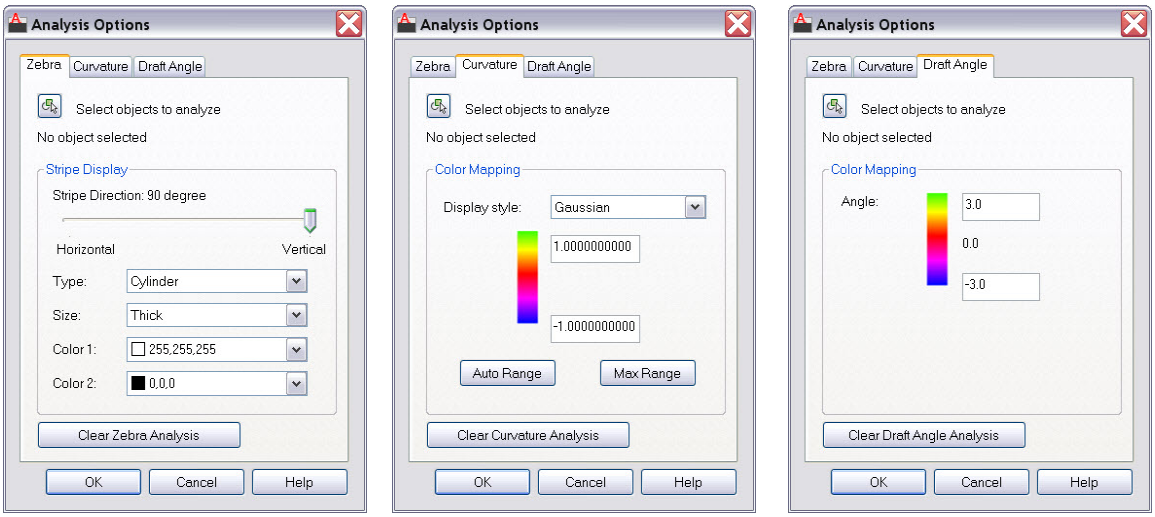


Figure 77. Analysis options

The analyses are visual representations similar to the visual styles, except that they can be applied per object.

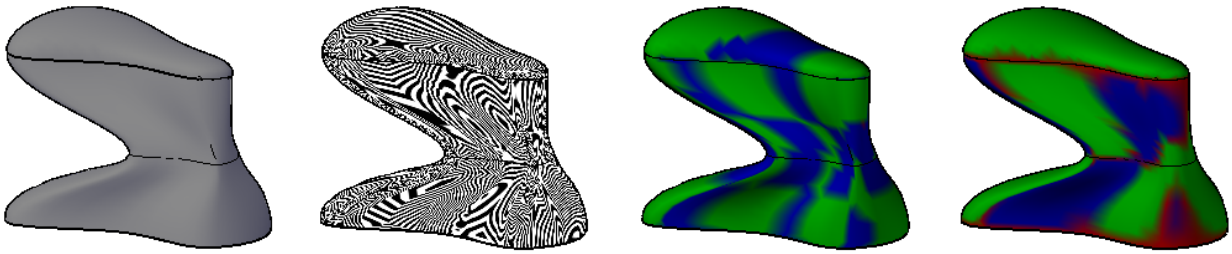


Figure 78. Example of analysis representations

Consistent Materials

AutoCAD 2011 provides powerful and intuitive tools for viewing, selecting, and editing materials. Access these tools from the Materials panel of the Render ribbon tab when the 3D Modeling workspace is active.

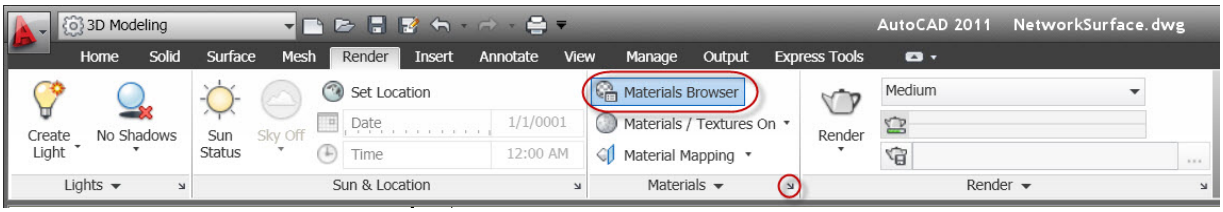


Figure 79. Render ribbon tab

The Materials Browser enables you to browse and search for materials from the Autodesk Materials Library of thousands of materials and user libraries, as well as from the current drawing. A list of the available libraries and their categories is available in the tree at the bottom left of the Materials Browser.

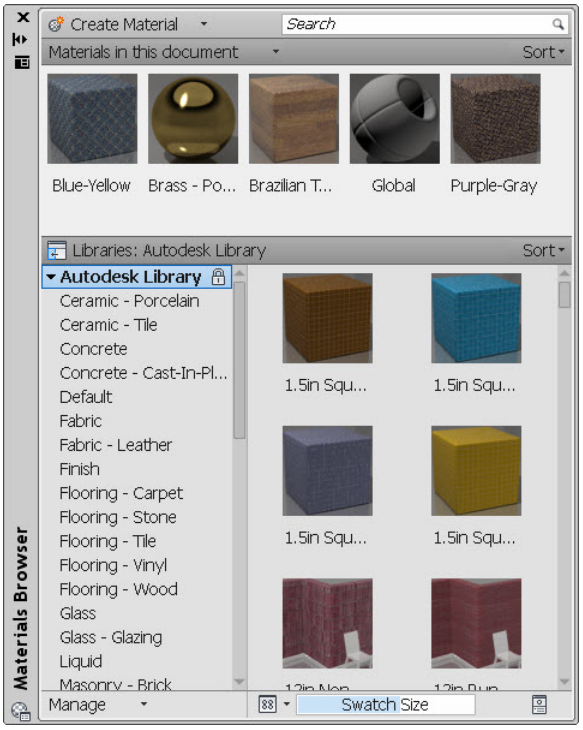


Figure 80. Materials Browser

In addition to the Autodesk Materials library, you can create and open your own materials libraries directly in the Materials Browser. Create categories within the materials library to organize and manage specific types of materials. To find specific materials, you can search on material characteristics, such as blue or ceramic. After locating a desired material in a library, add it to the current drawing via the right-click menu or drag and drop. Materials in the current drawing are displayed in the upper pane of the Materials Browser.

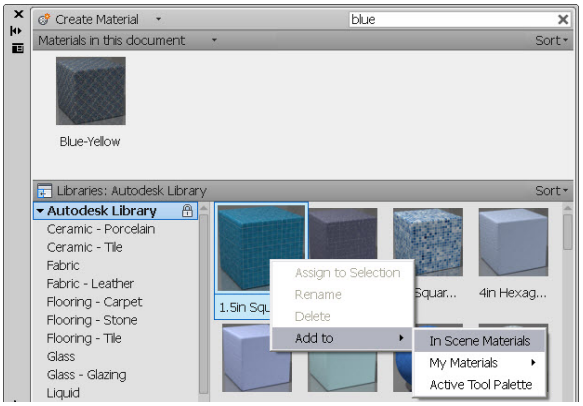


Figure 81. Autodesk Materials library

The Materials Editor offers many settings to modify properties of a material. You can access it from the dialog box launcher in the lower right corner of the Materials panel or from an icon in the lower right corner of the Materials Browser.

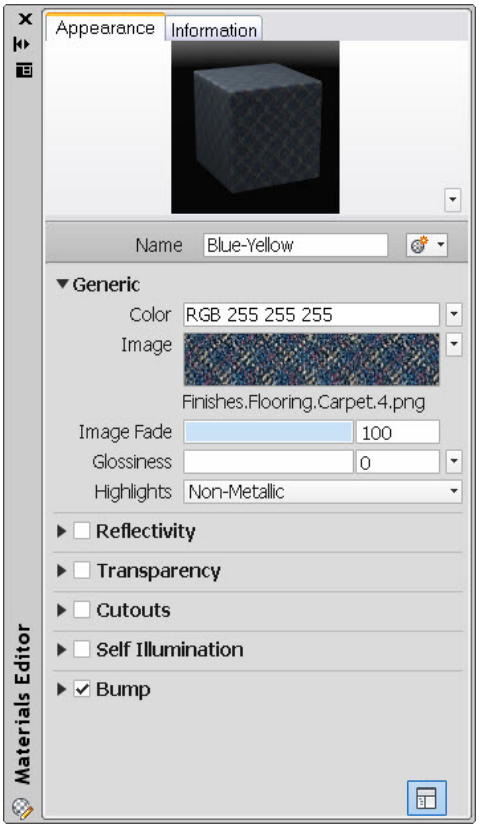
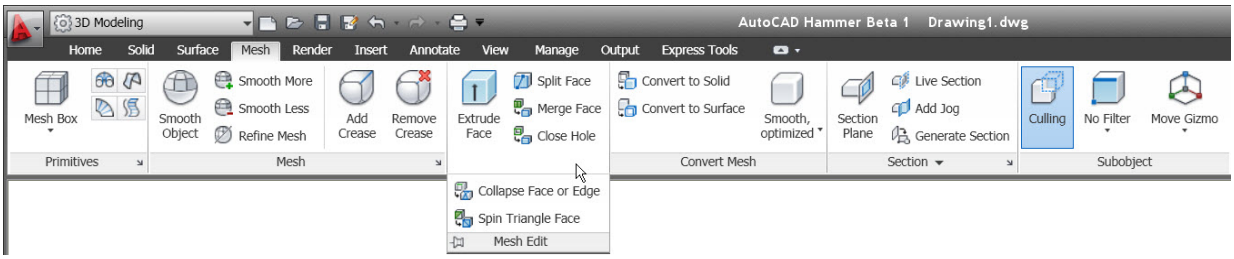


Figure 82. Materials Editor

Mesh Modeling

Mesh modeling functionality has been updated in AutoCAD 2011 to provide you with more flexibility and control. You can access the Mesh modeling tools from the Mesh tab when the 3D Modeling workspace is active.



The new Merge Mesh tool enables you to merge two or more adjacent faces into a single face.

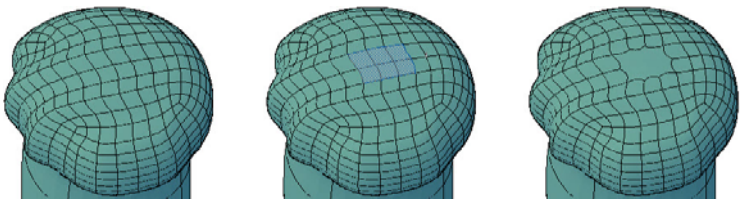


Figure 83. Mesh Merge example

You can use the Close Hole tool to close gaps in mesh objects by selecting the edges of the surrounding mesh edges.

Figure 84. Close Hole example

The Collapse Face or Edge tool enables you to force vertices of surrounding mesh faces to converge at the center of a selected edge or face.

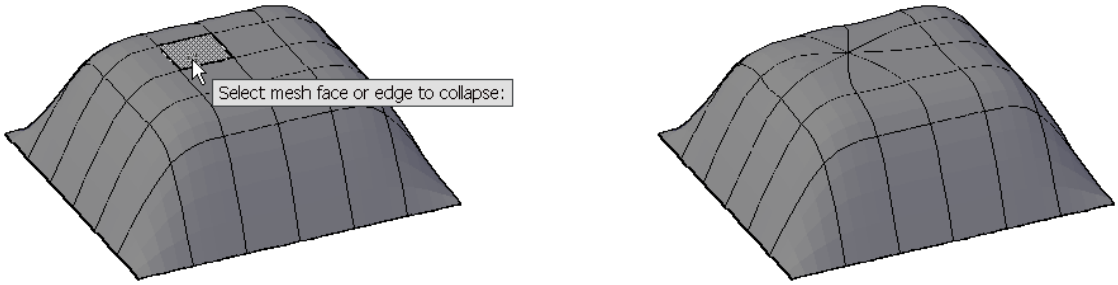


Figure 85. Collapse Face or Edge Example.

The Spin Triangle Face tool modifies the shapes of faces by rotating the edge that joins two triangular mesh faces.

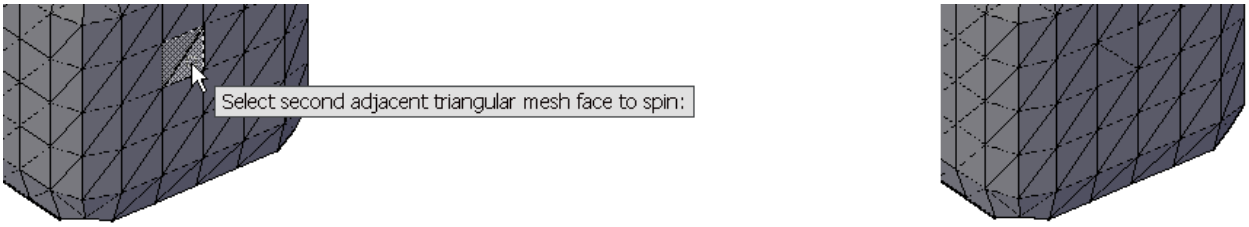


Figure 86. Spin Triangle Face example

Point Clouds

AutoCAD 2011 enables you to attach and display point clouds created from 3D scanning devices. You can access the new Point Cloud tools from the Insert ribbon tab.

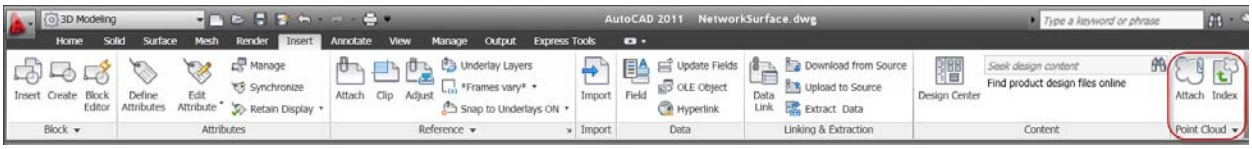


Figure 87. Point Cloud tools

The Index tool enables you to index scan data files from two different point cloud engines and save them as point cloud files.

Engine	Input files	Output files
Ambercore	.LAS	.ISD
Lightweight Engine	.XYB, .LAS, .FLS, .FWS	.PCG

You can attach a point cloud file (ISD or PCG) to an AutoCAD drawing in a similar manner to attaching other reference files.

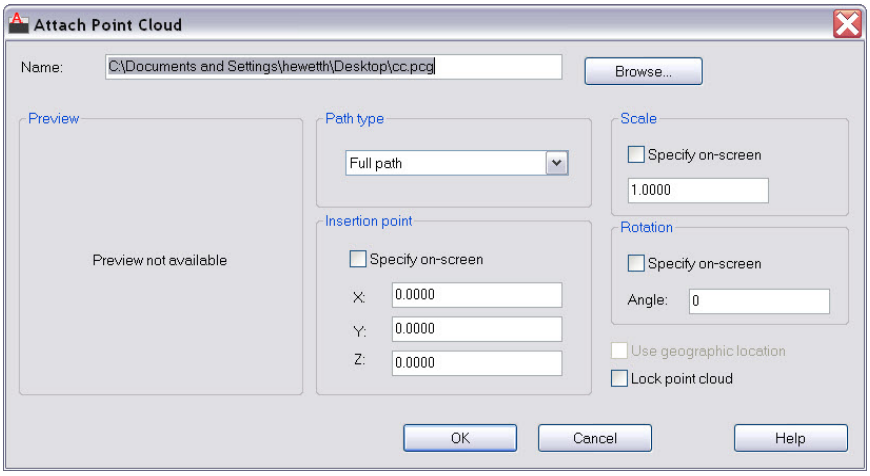


Figure 88. Attach Point Cloud dialog box

With a point cloud file attached, you can create and edit drawing geometry by snapping to points. Adjust the point density using the Density slider bar in the flyout of the Point Cloud ribbon panel.

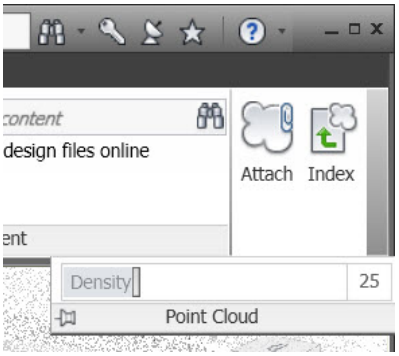


Figure 89. Point Cloud density

To support point cloud functionality, AutoCAD 2011 includes four new system variables:

- POINTCLOUDDENSITY controls the percentage of points displayed at once for all point clouds in the drawing.
- POINTCLOUDRTDENSITY controls the percentage of points displayed during real-time zoom, pan, and orbit.

- POINTCLOUDLOCK controls whether the lock property of the point cloud is set to Yes or No when a point cloud is attached.
- POINTCLOUDAUTOUPDATE controls whether point clouds are dynamically updated when transforming the point cloud or after zooming, panning, or orbiting.

Learning Resources

When you start AutoCAD 2011, a Welcome Screen is automatically displayed. From the Welcome Screen you can link to short videos to learn about key topics in AutoCAD. Additional links at the bottom of the Welcome Screen provide easy access to more learning resources, including What's New, Learning Path, and AutoCAD Online Help.

New Features Workshop

The New Features Workshop has been updated to include AutoCAD 2011 functionality. This interactive learning tool helps you discover the newest functionality with minimal effort. You can access the New Features Workshop from the drop-down menu on the InfoCenter toolbar, to the right of the Help button.

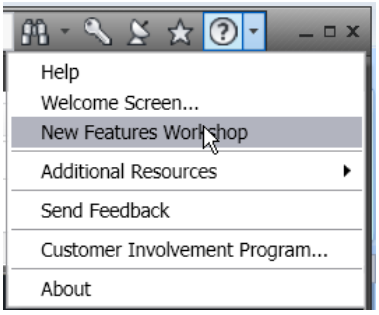


Figure 90. Learning tools

Online Help System

AutoCAD 2011 includes a web-based help system, which you can launch from the Help icon on the InfoCenter.

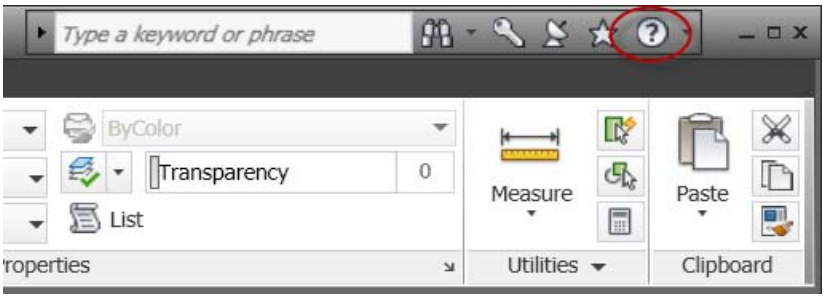


Figure 91. AutoCAD help

A control on the System tab of the Options dialog box allows you to disable the online help. Doing so displays a local version of the AutoCAD help system.

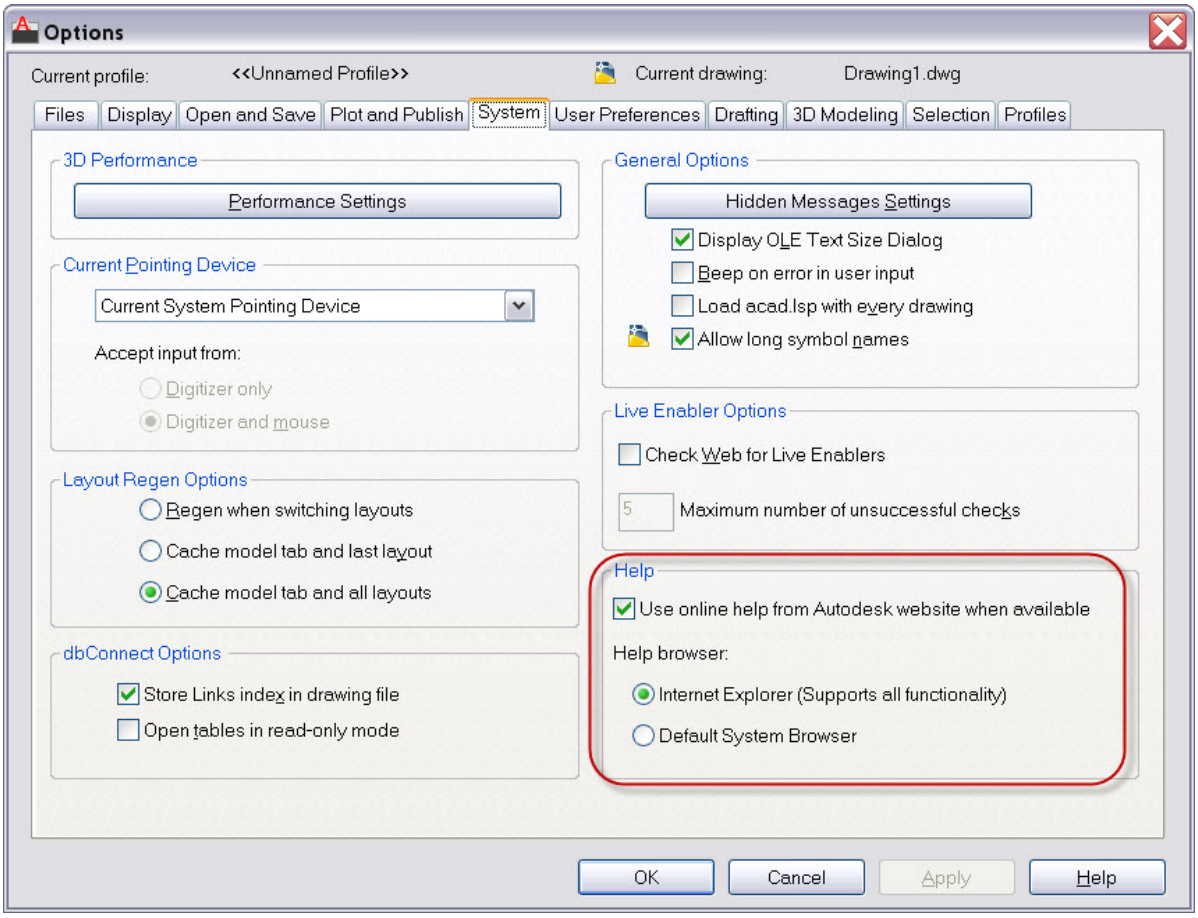


Figure 92. System tab of the Options dialog box

Autodesk Seek

Autodesk® Seek web service makes it easy to search for building product information and design files from inside your Autodesk® design application, as well as enabling you to download directly into your AutoCAD® drawings.

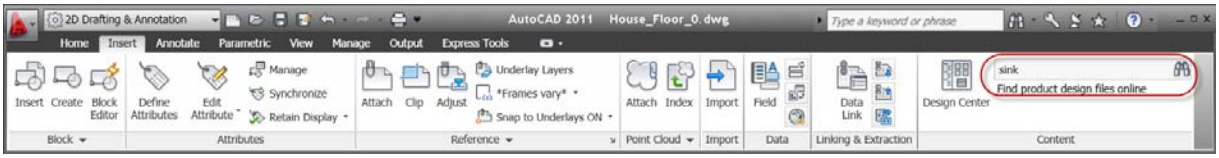


Figure 93. Content panel

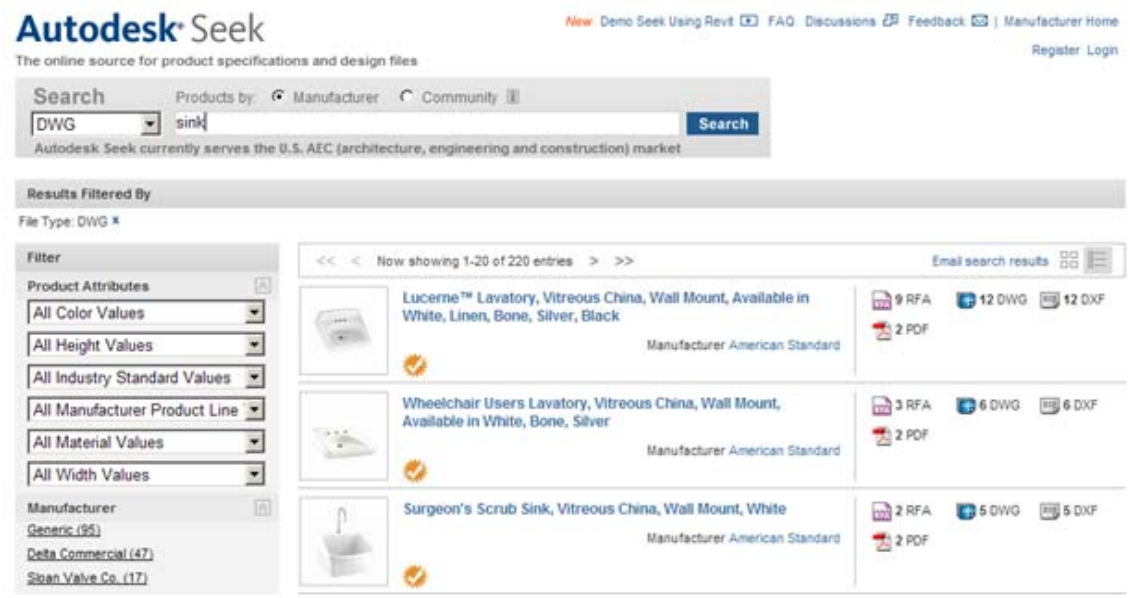


Figure 94. Browser window with search results automatically filtered by DWG.

More than 1,200 manufacturers and 35,000 products are available on Autodesk Seek. You are likely to find something you need among over the 100,000 DWG™ files on Autodesk Seek.

In addition, you can share designs with peers by uploading them directly from your AutoCAD files to the Autodesk Seek User Uploads. You can easily access the Share with Autodesk Seek button from the Output panel of the tab.

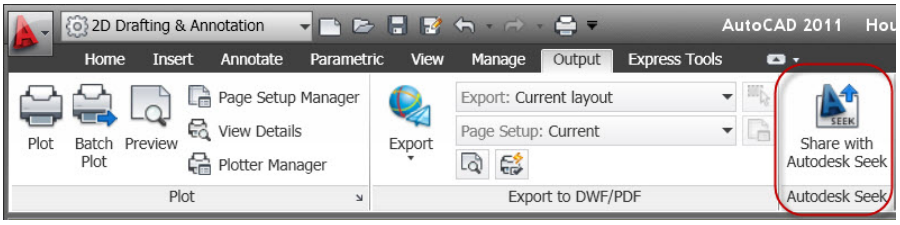


Figure 95. Share with Autodesk Seek on the Output panel

You can choose to share the current drawing or select a block definition within the drawing.

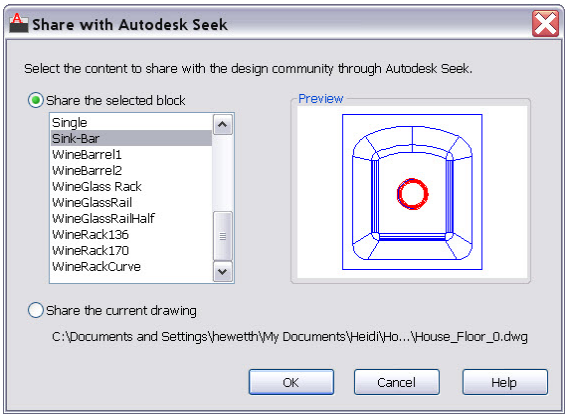


Figure 96. Share with Autodesk Seek

Thumbnails, title, and metadata are automatically extracted and indexed. Shared designs can be searched and downloaded by anyone.

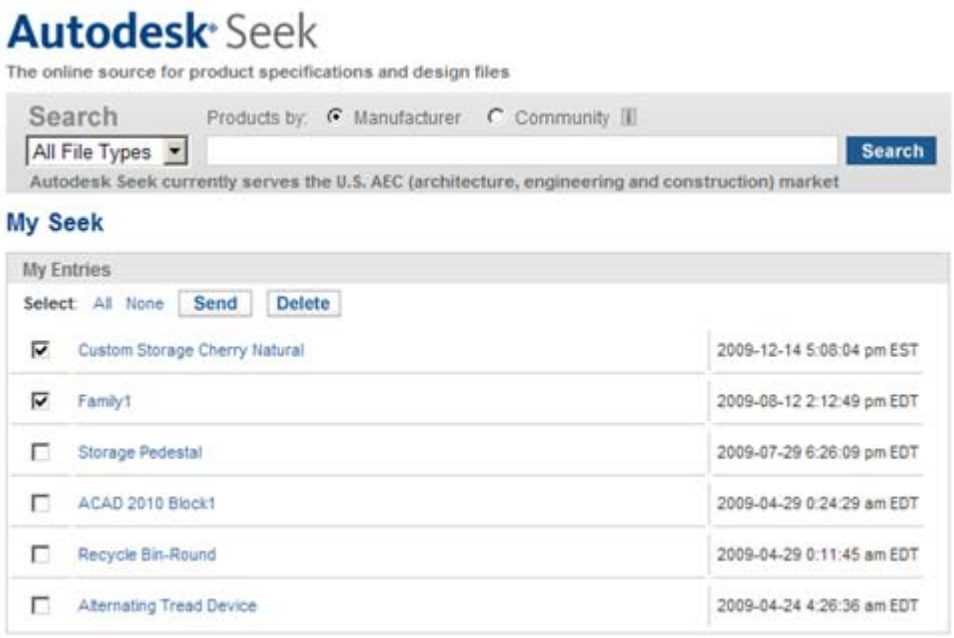


Figure 97. My Seek keeps track of all shared files in chronological order

After you log in, you can access My Seek, where you can delete or edit your design. You can also send a link to others by selecting and clicking on the Send button.

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