

Annotation Scaling: Making Drawings Smarter with Intelligent Text

David Cohn

GD315-1P Do you find it confusing that you draw everything full-size in AutoCAD®, but when it comes to text and annotations, you've got to think about the scale at which the drawing will eventually be plotted? Well, no more. The Annotation Scaling functionality in AutoCAD lets you create text, dimensions, hatch patterns, and other annotation objects that automatically change their size and placement to match the scale of the viewport. In other words, annotation scale is now automated. See how easy it is to apply annotation properties to text, dimensions, leaders, tolerances, blocks, attributes, and hatches. In this class you will learn everything you need to know to create annotation styles and apply annotation scales to layout viewports and model space. The annotation scaling tools can save you hours of time previously spent calculating scale factors, and creating, editing, and managing drawing annotations at multiple scales.

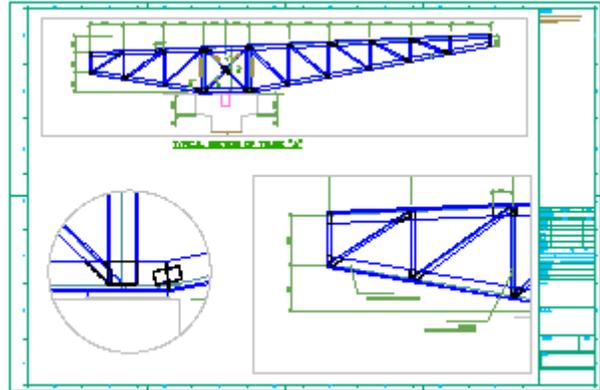
About the Speaker:

David has more than 20 years of hands-on experience with AutoCAD as a user, developer, author and consultant. He is an independent CAD consultant, a contributing editor to *Desktop Engineering* magazine, the former publisher and editor-in-chief of *CADCAMNet* and *Engineering Automation Report*, the former senior editor of *CADalyst* magazine, and the author of more than a dozen books on AutoCAD. A licensed architect, David was also one of the earliest AutoCAD third-party software developers, creating numerous AutoCAD add-on programs. As an industry consultant, David has worked with many companies including Autodesk. He teaches college-level AutoCAD courses and is always a popular presenter at Autodesk University.

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Introduction to Annotation Scaling

Annotations are a crucial part of almost any drawing, and creating them can consume a considerable amount of your workday. In earlier versions of AutoCAD, creating annotations in model space required manual calculations and you often had to recreate and copy annotations to multiple layers in order to display them appropriately at different scales. Maintaining multiple copies of the same data was difficult and prone to error.

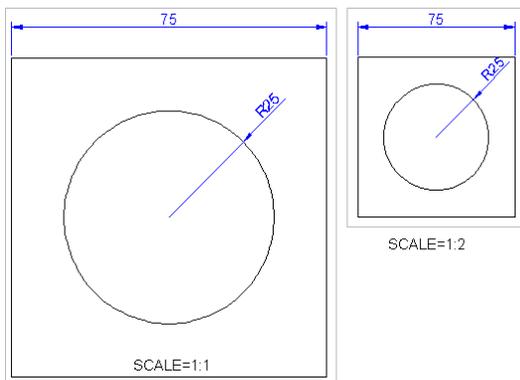


This drawing contains multiple viewports at different scales. The geometry is drawn at full scale, but each view of that geometry is scaled to fit on the sheet of paper. Using a traditional approach, in order to create dimensions that appeared at a uniform size in relation to the overall drawing sheet, you would have to use a different dimension scale factor and draw on a different layer in for each viewport. But annotation scaling eliminates these additional steps.

Definition of Annotation Scaling

Annotation scaling is a process in which objects such as text, dimensions, and hatch patterns are automatically scaled based on the scale of the view in which they are displayed. You create an annotation scale for each view you use to display the object.

The illustration below shows how annotation scaling works. The drawing contains one square, one circle, and two dimensions. The same objects are viewed through two viewports at different scales. While the viewport scale factors present the geometry at different scales, the dimensions are displayed at exactly the same size. This occurs because there are two scale representations for each dimension. One representation is equal to 1:1 and is only visible in the viewport that is scaled at 1:1, while the other scale representation is equal to 1:2 and is only visible in the viewport that is scaled to 1:2.



With annotation scaling enabled, AutoCAD automatically calculates and applies properties, such as text height, based on the current annotation scale. It also uses the annotation scale to determine which annotations are visible in which viewports. You can control the location of individual scale representations while having the information itself coming from a single source.

Annotation scaling is like having multiple versions of annotation objects all at different scales, and their visibility is controlled automatically based on the scale of the viewport through which they are seen.

Annotative Objects

You can apply annotative scaling functionality to any of the following object types:

- Text (Text, Mtext)
- Dimensions (Dimensions, Leaders, Tolerances)
- Multileaders
- Hatches
- Blocks
- Attributes

As you create new drawings, you should use the annotative options or styles supported by these object types. You can also easily convert existing instances of any of these object types into annotative objects.

How do you scale annotations now?

To better understand how to use annotation scaling, think about how you create dimensions and text annotations in model space using traditional methods.

1. Set the viewport scale (i.e. $1/8"=1'-0"$)
2. Calculate the scale factor (i.e. $1/8" \times 12"=96$)
3. Set the dimension text (DIMTXT) to the proper height (i.e. $3/32"$)
4. Set the dimension scale (DIMSCALE) to the scale factor (i.e. 96)
5. Calculate the model space height for text (i.e. $3/32" \times 96=9"$)
6. Set the text size (TEXTSIZE) to the model space height (i.e. 9")

What if you want to change the viewport/plot scale?

Perhaps a scale of $1/8"=1'-0"$ won't fit on the sheet. In that case, you'd have to repeat the previous process for the new scale.

What if you want to display the annotations at several different scales?

1. Copy the annotations to a new layer for each different scale.
2. Repeat the previous process for each scale.
3. Turn layers on and off for appropriate scales in each viewport.

What if you want to edit the content?

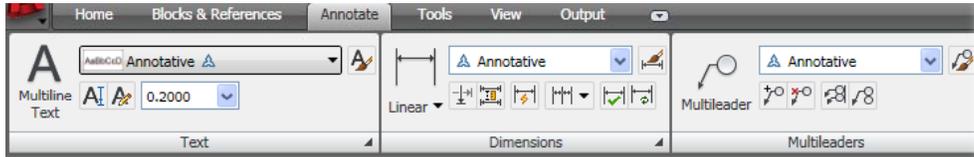
- A. Give up?
- B. Bill by the hour?
- C. Use annotation scaling!

How does annotation scaling compare to the traditional method?

1. Set the annotation scale (i.e. $1/8"=1'-0"$)
- ~~2. Calculate the scale factor (i.e. $1/8" \times 12"=96$)~~
3. Set the dimension text (DIMTXT) to the proper height (i.e. $3/32"$)
- ~~4. Set the dimension scale (DIMSCALE) to the scale factor (i.e. 96)~~
- ~~5. Calculate the model space height for text (i.e. $3/32" \times 96=9"$)~~
6. Set the text size (TEXTSIZE) to the proper height (i.e. $3/32"$)

Annotative Styles

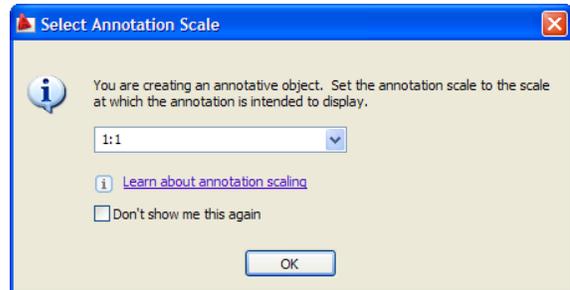
In the following image, annotative styles are shown on the ribbon bar. These styles are available in any drawing created from one of the templates provided.



Select Annotation Scale

The first time you create an annotative object, the Select Annotation Scale dialog box is displayed. You select an annotation scale from the list and click OK. The selected scale becomes the default annotation scale for the current drawing.

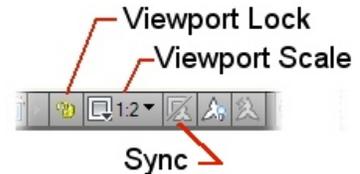
The selection you make here is also displayed on the status bar, next to Annotation Scale.



This dialog box is displayed once per session of AutoCAD on your first attempt to create an annotative object. The scale setting can be changed at any time on the status bar by selecting a scale on the Annotation Scale list.

Annotation Scaling Tools

To begin using the annotation scaling functionality, you will need to familiarize yourself with several new annotation scaling tools including the Viewport Lock, Viewport Scale, and Annotation Scale.



The Viewport Lock is displayed on the Status Bar when a layout viewport is selected or active. You can lock and unlock a viewport using this button or using other methods, including the right-click menu and the Properties or Quick Properties palettes. Locking a viewport after setting an appropriate viewport scale prevents you from inadvertently zooming or changing the scale.

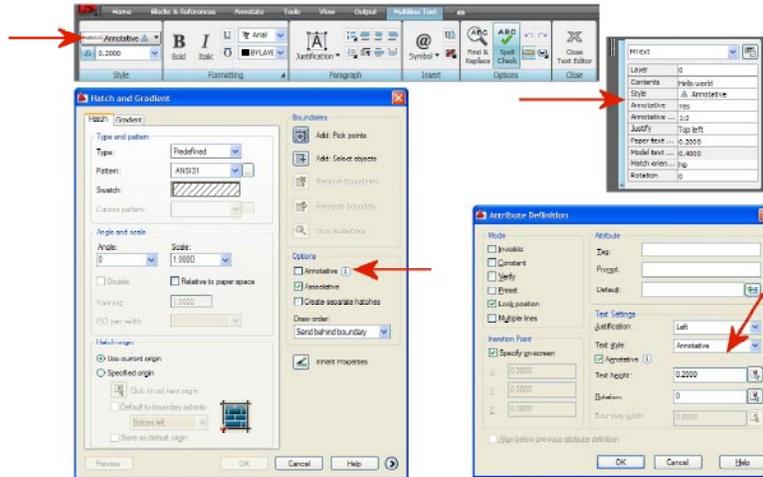
The Viewport Scale is also displayed on the Status Bar when a layout viewport is selected or active. It enables you to view and edit the scale at which the active viewport is displayed. You can change the viewport scale using this button or using other methods, including the Viewports toolbar and the Properties or Quick Properties palettes.

The Annotation Scale is displayed on the Status Bar when the Model Space tab is active. The Annotation Scale sets the CANNOSCALE system variable, which is what tells AutoCAD the scale to use when creating annotations (and is initially set when you create the first annotative object in the drawing).

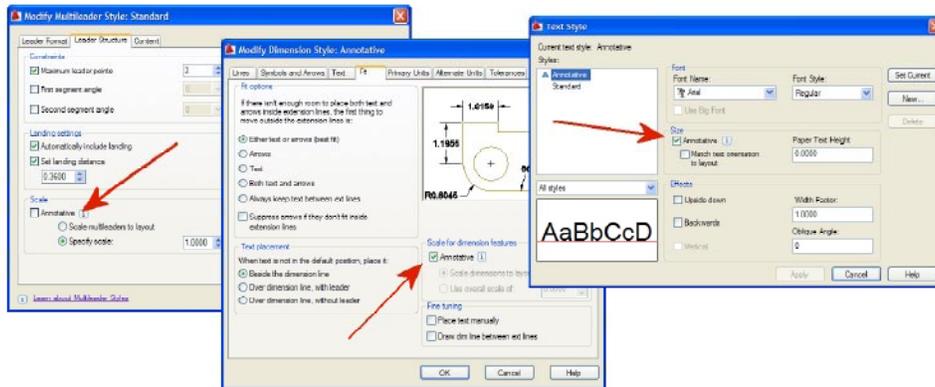
Typically, you want AutoCAD to assume an annotation scale that is the same as the viewport scale. When you set either the Viewport Scale or Annotation Scale using the tools on the Status Bar, AutoCAD automatically updates both the viewport and annotation scale, keeping them in sync. When a Layout tab is active, if you change the viewport scale by zooming, however, the viewport and annotation scale can get out of sync. In that case, the Sync button becomes active; clicking this button resets the viewport scale so that it once again matches the annotation scale.

Annotative Objects

All objects that support annotation scaling (Text, Mtext, Dimensions, Leaders, Tolerances, Multileaders, Hatches, Blocks, and Attributes) include a new Annotative object property. You can view and modify the Annotative property using the Properties or Quick Properties palettes as well as the object-specific editing tools, such as the Multiline Text Editor, the Hatch dialog box, and so on.



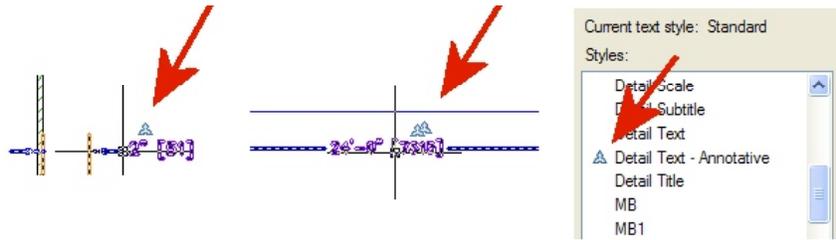
In addition, for objects that use styles (Text, Dimensions, Multileaders), you can create and apply annotative styles.



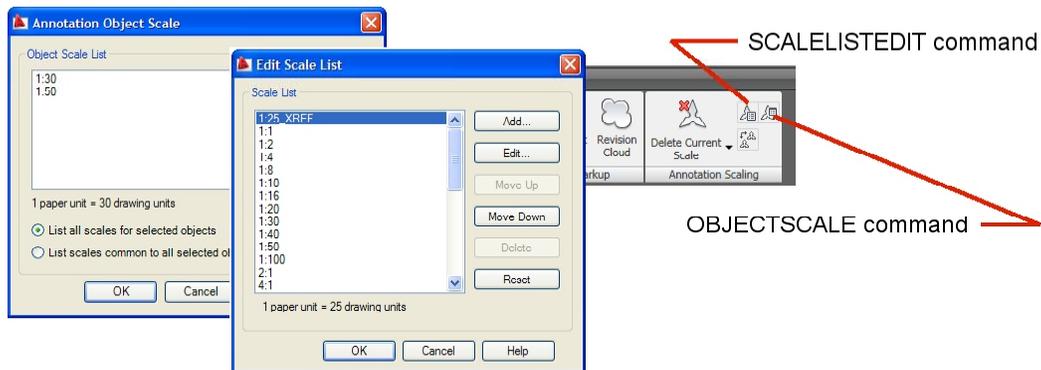
When an object's Annotative property is enabled, a new Annotative Scale property is automatically applied to the object. Every annotative object must include one or more annotative scales. These are the scales at which you want the object to be represented. Using traditional methods, if you wanted an object, such as text, to be displayed at several different scales while maintaining the same height, you would have created several copies of the object, each on its own layer. Each object would have been created at a different model space height based on the scale at which you were going to display it and the paper space height at which you wanted it displayed. Annotative objects perform the same function with fewer steps and without having to create duplicate copies of the object.

You can differentiate between annotative objects and non-annotative objects by the presence of an annotative icon. When you pass your cursor over an annotative object, an annotative icon is automatically displayed near the cursor. A single icon indicates that the object currently supports only one annotative scale; a double-icon indicates that the object currently supports

two or more annotative scales. Similar annotative icons are also used to indicate which styles in a style list are annotative.



You can view, add, and delete the object scales supported by an object using the Annotation Object Scale dialog box, which is displayed using the OBJECTSCALE command. This command appears on the Annotation Scaling panel on the Annotate ribbon tab. The list of available scales displayed in this dialog box comes from the general AutoCAD Scale List, which you can customize using the SCALELISTEDIT command. This command also appears on the Annotation Scaling panel on the Annotate ribbon bar.

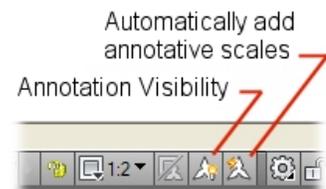


The annotative scales of an object determine the size as well as the visibility of the object's scale representations. When a viewport or the Model tab is set to a particular annotation scale, only the annotative objects that support the current annotation scale are normally displayed.

Status Indicators

Since the visibility of annotative objects is determined by the current Annotation Scale and the supported Annotative Scales of the various objects, it is possible for some or all of the objects to disappear when you change the annotation scale to a value for which the objects have no representation. You can use two tools on the Status Bar to remedy this situation.

You can quickly display all annotative objects, regardless of their supported annotative scales, using the Annotation Visibility control (the annotative light bulb button, which toggles the ANNOALLVISIBLE system variable). You can then select any of the objects and add or delete Annotative Scales. To avoid confusion caused by having annotative objects display when they are not supported by the current Annotation Scale, you should disable Annotation Visibility except when needed.



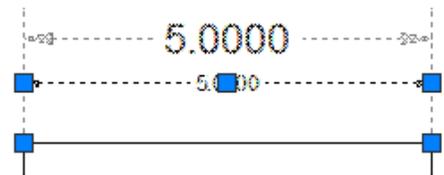
The second tool (the annotative lightning bolt button, which toggles the ANNOAUTOSCALE system variable) enables you to automatically add scales to annotative objects when the annotation scale changes. For example, if the annotations in the current viewport only include an Annotative object scale of 1:50 and you want to change the viewport/annotation scale to

1:100, you can turn this button on so that the new scale (1:100) is automatically added to all of the annotative objects within that viewport. If you are experimenting with various viewport sizes, it is best to disable this option until you settle on a size. Otherwise, you might inadvertently add unwanted annotative scales to the objects. Each of these status indicators can be in one of two modes.

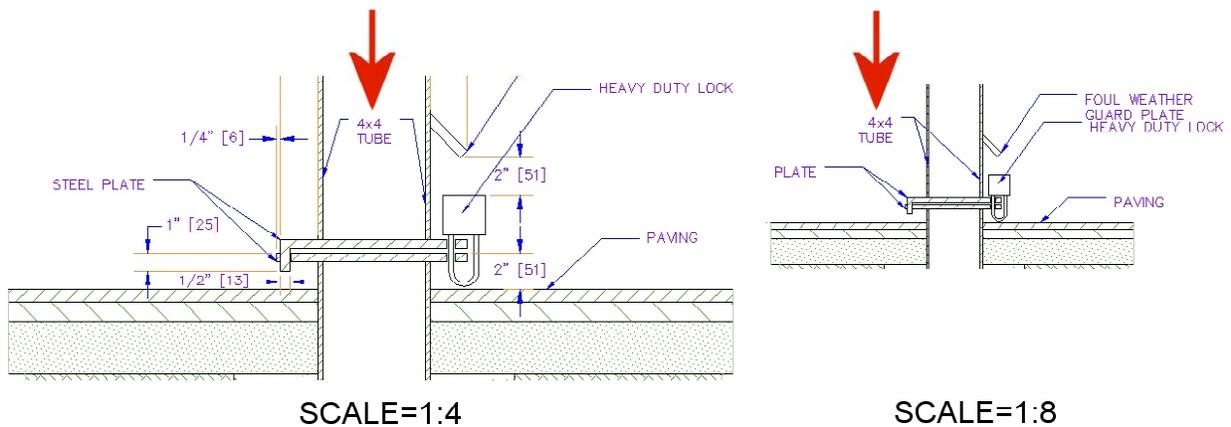
Icon	Description
	When the status indicator is in this mode, AutoCAD shows annotation objects for all scales.
	When the status indicator is in this mode, only the scale representations that match the current annotation scale setting are shown.
	When the status indicator is in this mode, new scale representations are created automatically if the annotation scale changes.
	When the status indicator is in this mode, scale representations are not created automatically as the annotation scale changes.

Additional Annotation Scaling Tools

When you select an annotative object that has more than one annotative scale, AutoCAD may temporarily display all of its scale representations in the current viewport. If this is objectionable, you can change the value of the SELECTIONANNODISPLAY system variable so that AutoCAD displays the annotative object only at the current scale (a value of 0 turns off the display of alternate scale representations).

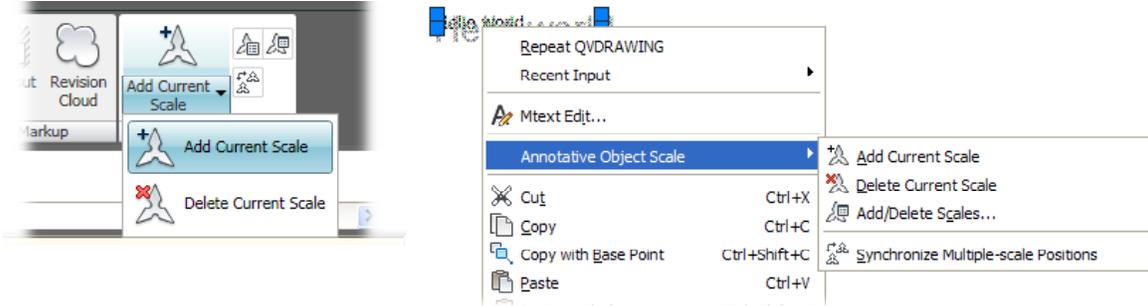


Another feature of annotative objects is the ability to move the objects to different positions for each scale representation. In the following illustration, the callout text (an annotative multileader) is located in one position when viewed at a small scale and in a different position when viewed at a larger scale.



You can use the ANNORESET command to reset the location of all scale representations for an annotative object to that of the current scale representation.

You can also add or delete scale representations by using the tools on the Annotation Scaling panel of the Annotate ribbon tab, or by right clicking on an annotative object and selecting the desired tool from the shortcut menu. (Note that the OBJECTSCALE and ANNORESET commands also appear on this shortcut menu.)



Transitioning to Annotation Scaling

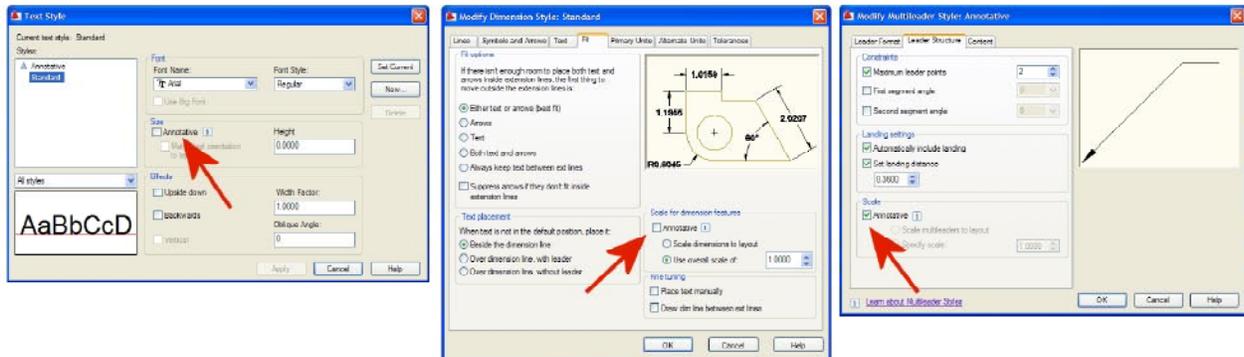
The steps for implementing annotation scaling will vary slightly depending on the types of objects and whether they are being created as new objects or already exist in your drawing.

Text, Dimensions, and Multileaders

To implement annotation scaling for objects that use styles—including text, dimensions, and multileaders—you should first create annotative styles. You can create new styles or edit your existing ones. If you’ve created multiple styles for the sole purpose of producing annotations at different scales, you can delete the extra styles.

To create/edit styles:

1. Access the style definition by creating a new one or modifying an existing one.
 - Set the desired size for text, arrowhead, etc. This is the real (paper) size of the objects.
 - Enable the Annotative property. The location of this control varies for each type of style.
2. Save the updated style definition.



After you’ve defined the annotative styles, you can quickly create new annotative objects based on those styles:

1. Set an Annotative Style.
2. Set the Annotation Scale for the current viewport or Model tab to an appropriate size. This is what determines the default annotative scale for the new objects you create.
3. Create the text, dimensions, or multileaders.
4. Add/remove annotative scales for selected objects as needed.

To update existing text, dimensions, and multileaders:

1. Edit the associated styles so that they are annotative.
2. Set the Annotation Scale for the current viewport or Model tab to the scale that you assumed when creating the original annotations. For example, if you created text at a height of 9" because you wanted it to be 3/32" tall when scaled at 1/8"=1'-0", you should set the Annotation Scale to 1/8"=1'-0".
3. Use ANNOUPDATE and select the objects that you want to support the current Annotation Scale.
4. Repeat steps 1-2 for objects you want to support a different Annotation Scale.
5. Add/remove annotative scales for selected objects as needed.

Of course, you could also simply change the annotative object property of the existing objects, but then you would need to modify each object individually to convert it into an annotative object; changing the style is much more efficient.

Hatches

Using annotation scaling makes it easy to create hatch objects that automatically maintain the hatch size even when the viewport scale changes.

To create new hatches:

1. Set the Annotation Scale for the current viewport or Model tab to an appropriate size. This is what determines the default annotative scale for the new objects you create.
2. Access the Hatch and Gradient dialog box, ensure that the Annotative property is enabled, and apply the other hatch properties as you normally would.

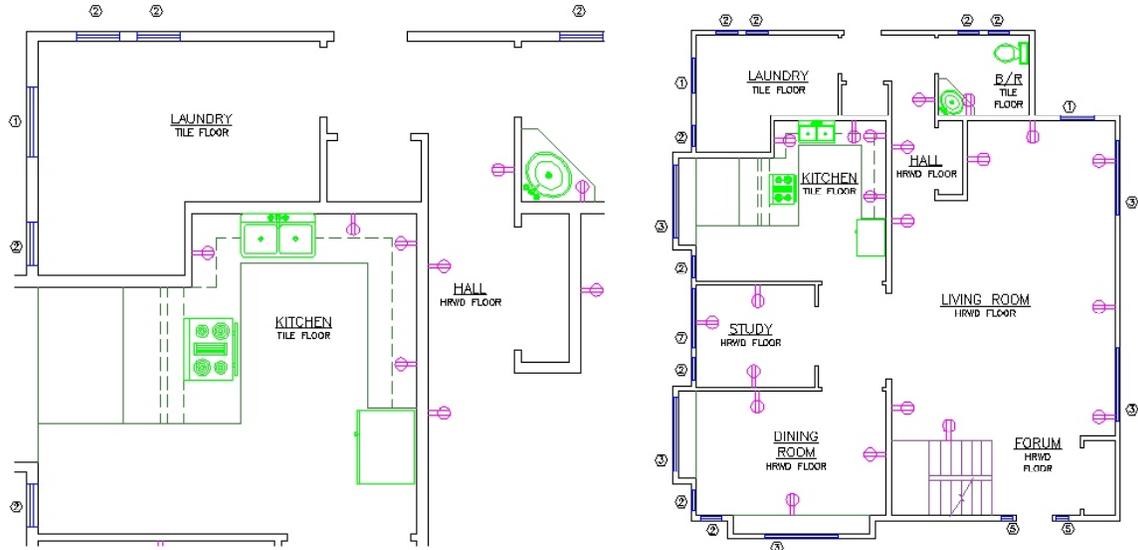
To update existing hatches:

1. Set the Annotation Scale for the current viewport or Model tab to the scale that you assumed when creating the original hatches.
2. Select the hatch objects that you want to support the current annotation scale and enable the Annotative property using the Hatch Edit dialog box or the Properties or Quick Properties palette.
3. Repeat steps 1-2 for hatch objects that you want to support a different Annotation Scale.
4. Add/remove annotative scales for selected hatch objects as needed.

Blocks

Annotative block definitions enable you to insert block references that are consistently sized regardless of the viewport scale. In general, annotative blocks would be symbols that are not drawn at real sizes for actual objects. For example, a chair or table in a floor plan would not be annotative, because you would want them to scale up or down with the rest of the geometry. But a window tag or an electrical receptacle symbol would likely be an annotative object because you would want those objects to remain at the same size even when the viewport scale changes.

For example, in the illustration below, notice that the stove and sink in the kitchen appear larger in the 1/4"=1'-0" view on the left than in the 1/8"=1'-0" view on the right, but the room labels, window tags, and electrical receptacles are the same size in both views.



SCALE: 1/4"=1'-0"

SCALE: 1/8"=1'-0"

You can apply the annotative property to block definitions within a drawing file or to individual drawing files that can be inserted as blocks. Although the Annotative property is stored in the block definition, the object's Annotative Scales are applied to each individual block reference.

To create/update block definitions:

1. Access the block definition in the Block Editor.
 - Set the Annotation Scale at 1:1.
 - Ensure block geometry is drawn at the size you want it represented.
 - Enable the Annotative property in the Property palette.
2. Save the updated block definition.

To create/update block drawing files:

1. Create/Open the block geometry in the drawing editor.
 - Ensure block geometry is drawn at the size you want it represented.
 - Enable the ANNOTATEDWG system variable. (Note that you can only enable the ANNOTATEDWG variable for drawings that contain no annotative objects.)
2. Save the updated drawing file.

To insert new block references:

1. Ensure that the block definition is annotative.
2. Set the Annotation Scale for the current viewport or Model tab to an appropriate size. This is what determines the default annotative scale for the blocks you insert.
3. Insert blocks with a unit scale of 1.
4. Add/remove annotative scales for selected block objects as needed.

To update existing block references:

1. Ensure that the block definition is annotative.
2. Ensure the inserted scale of block references is 1.
3. Add/remove annotative scales for selected block insertions as needed.

Attributes

You can apply the annotative property to attribute definitions to ensure that the attribute text within non-annotative blocks automatically adjusts based on the viewport's annotation scale.

You cannot include annotative attributes or any other annotative objects within an annotative block.

To create new attribute definitions:

1. If you are adding attributes to an existing block, access the block definition in the Block Editor.
2. Set the Annotation Scale at 1:1.
3. Access the Attribute Definition dialog box.
 - Ensure that the Annotative Property is enabled.
 - Set the Text Height to the proper paperspace text height.
 - Apply other attribute properties as usual.
4. Insert the attribute definition into the block definition.
5. Save the block definition.
6. If modifying an existing block, use ATTSYNC to synchronize existing block insertions with the new attributes.

To update existing attribute definitions:

1. Open the block definition in the Block Editor.
2. Set the Annotation Scale at 1:1.
3. Select the attribute definitions and open the Properties palette.
 - Enable the Annotative property.
 - Set the Text Height to the proper paperspace text height.
4. Save the updated block definition.
5. Use ATTSYNC to synchronize existing block insertions with the updated attributes.

Annotative Orientation

Annotative blocks and text can be set so that their orientation matches the orientation of the layout. The orientation of annotative hatches always matches the orientation of the layout.

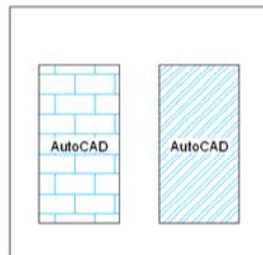
Even if the view in the layout viewport is twisted or if the viewport is non-planar, the orientation of these objects in the layout viewports will match the orientation of the layout.



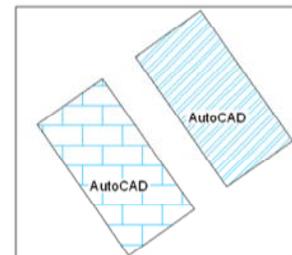
Plan view



Isometric view



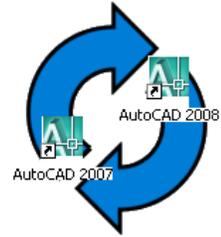
View twist = 0



View twist = 35

Using Visual Fidelity Control

Maintaining visual fidelity for annotation scaling objects is critical if you are sharing your drawings with others who may be using AutoCAD 2007 or earlier versions of AutoCAD. Because annotation scaling was not available in versions of AutoCAD prior to 2008, considerations must be taken to successfully view drawings in an older release and then return them to the current release.



Description of Visual Fidelity

When you open a drawing that contains annotative objects in AutoCAD 2007 or an earlier version, for each annotation scale representation that exists, a separate layer is created to display the annotation object specific to that scale.

For example, suppose you create annotative objects on a layer called Annotation. In that drawing, annotative scale representations exist for the 1:1, 1:20, 1:30, and 1:40 scales. If the Maintain Visual Fidelity option is chosen, when the drawing is opened in a previous version of AutoCAD, additional layers appear in the Layer Properties Manager. In this example, you would see the following layers:

- Annotation
- Annotation @ 1
- Annotation @ 20
- Annotation @ 30
- Annotation @ 40

S..	Name	On	Freeze	Lock	Color	Linety
0					white	Conti
Annotation					160	Conti
Defpoints					white	Conti
Geometry					96	Conti

Annotation layer viewed in AutoCAD 2008 or later

Stat	Name	On	Freeze	Lock	Color	Linety
0					wh...	Conti
Annotation					160	Conti
Annotation @ 1					160	Conti
Annotation @ 20					160	Conti
Annotation @ 30					160	Conti
Annotation @ 40					160	Conti
Defpoints					wh...	Conti
Geometry					96	Conti

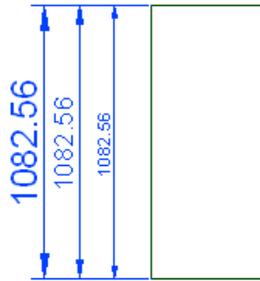
Annotation layers as viewed in AutoCAD 2007 or earlier

Managing Annotative Object Visibility in a Previous Release of AutoCAD

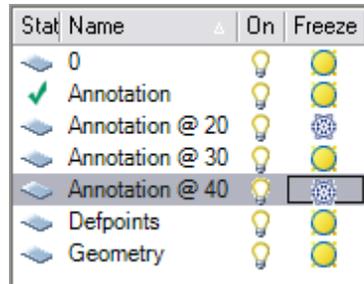
For each annotative object that exists, an anonymous block is displayed when the drawing is opened in a version of AutoCAD prior to AutoCAD 2008. To control the visibility of scale representations, you freeze the layers that you do not want to be seen.

In the following illustration, a single anonymous block contains three annotative scale representations. By freezing the Annotation @ 20 and Annotation @ 40 layers, only the 1:30 scale representation remains visible.

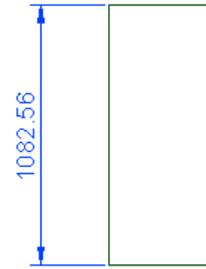
Annotation Scaling—Making Drawings Smarter with Intelligent Text



All scales visible by default



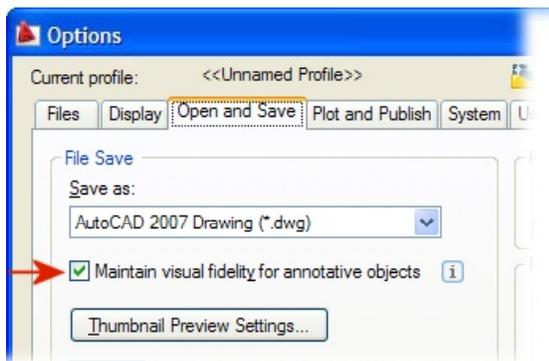
Freezing the unnecessary layers



Only the 1:30 scale representation is visible

Note that in the illustrations, the annotation objects were spaced intentionally for clarity. In an actual drawing, the scale representations could be positioned on top of one another.

The Maintain Visual Fidelity for Annotative Objects option is available on the Open and Save tab of the Options dialog box. Selecting or clearing this option sets the SAVEFIDELITY system variable to 1 (on) or 0 (off).



The following steps give an overview for using visual fidelity control to round trip edit drawings that use annotation scaling to early versions of AutoCAD and back:

1. Open a drawing that contains annotative objects.
2. Access the Open and Save tab of the Options dialog box and make sure the Maintain Visual Fidelity for Annotative Objects option is selected. Click OK.
3. Save the drawing.
4. Open the drawing in a previous version of AutoCAD.
 - Open the Layer Property Manager and freeze the annotation layers that are not required.
 - Make the required edits to the drawing.
 - Save the Drawing.
5. Open the drawing in the current version of AutoCAD. The annotative objects should remain intact and unaffected by the round trip editing.

Guidelines for Using Visual Fidelity Control

When round tripping drawings that contain annotative objects, consider the following:

- If you work primarily in model space, you should turn off visual fidelity by clearing the option in the Options dialog box or setting the SAVEFIDELITY system variable 0. When set to 0, annotative objects are treated as their non-annotative equivalent when the drawing is opened in a version of AutoCAD that does not support annotation scaling. For example, an annotative text object is treated as standard text and an annotative dimension is treated as a standard associative dimension.
- If your work utilizes layouts with scaled viewports, and you need to share your drawings with others using AutoCAD 2007 or earlier versions, you should maintain visual fidelity by selecting the option in the Options dialog box or set the SAVEFIDELITY system variable to 1.
- If the dimensions must be edited in a version of AutoCAD that does not support annotation scaling, they must be exploded. Doing so creates a separate dimension for each scale representation. The unused dimensions should then be deleted. The remaining dimensions are still treated as annotative when the drawing is opened in a version of AutoCAD that supports annotation scaling.

Solving Annotation Scale Slowdowns

Some users have experienced slowdowns when drawings contain multiple annotation scales. To correct this problem, you should reset the scale list using the Scale List Cleanup Utility. This utility allows you to specify a scale list template containing a user-defined scale list. When you run the utility, unused scales are deleted from files and the scale list from the selected template is applied. You can download the Scale List Cleanup Utility from the Autodesk website.

For individual drawings, follow these steps to manually reset the scale list:

1. On the command line, type **–SCALELISTEDIT**.
2. Type **R** to select the Reset option, and press Enter.
3. When prompted to reset scale list to defaults, type **Y** and press Enter.
4. Type **E** to exit or press ESC.

Resetting the scale list manually will cause all of your custom annotation scales to be lost and the list will reset to the default list.

Note that nested external references may produce excess scales. To correct this issue, you should install AutoCAD 2008 Service Pack 1 or upgrade to AutoCAD 2009. The Scale List Cleanup Utility repairs files affected before the necessary service pack was installed.