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AutoCAD 2009 – Scaling and Adjusting the Coordinate System of AutoCAD Objects

This workflow is demonstrated on AutoCAD drawings for the University of Arkansas Mapping and Room Use Study in the Fall of 2010. In this case, the reference drawing is a globally accurate campus map (in engineering units). Detailed, floor plans of individual buildings (in architectural units with no global coordinate system) are scaled to be placed in the campus map for eventual use in GIS applications.

In updated versions of ACAD, drawings are scaled automatically when they're inserted into a drawing with a different scale. However, in older versions and depending on how drawings were created, automatic scaling does not always work. Sometimes, objects within a DWG need to be scaled manually to a known dimension, another object, or an image. This example covers manually scaling and aligning ACAD object(s) by using another object as a reference. Please see 'AutoCAD Interface and File StructureBasics' for basic navigation and file structure information.

I. Aligning & Scaling an ACAD object using another ACAD object as a reference -

A. **Open the reference drawing** (ie: campus map) as read only > File > Open > Select file name > **DO NOT click 'Open',** use the pull-down arrow to select **'Open Read-only'** > Locate the object (ie: individual building) that you are scaling

NOTE: Opening the reference DWG read-only allows you to use it freely as a reference without affecting the original drawing. It protects against accidently overriding the original source file.

B. Open the drawing with the objects to be adjusted (ie: individual floor plan) > It is recommended to **'Open Read-only'** on this drawing as well >Adjust the layers so that only those layers that you want to use are visible > Confirm all visible lines are closed polylines
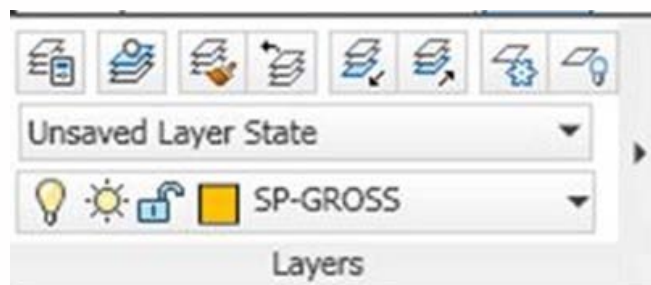

Figure 1 – Layers Manager Toolbar

C. Select the object(s) > RC > Clipboard > Copy with base point > LC on a significant point on object(s) to specify the **base point** (See "*Copying & Pasting Objects*" in AutoCAD Basics for more information) > Using the lower, left corner consistently is recommended for ease in remembering and placing objects
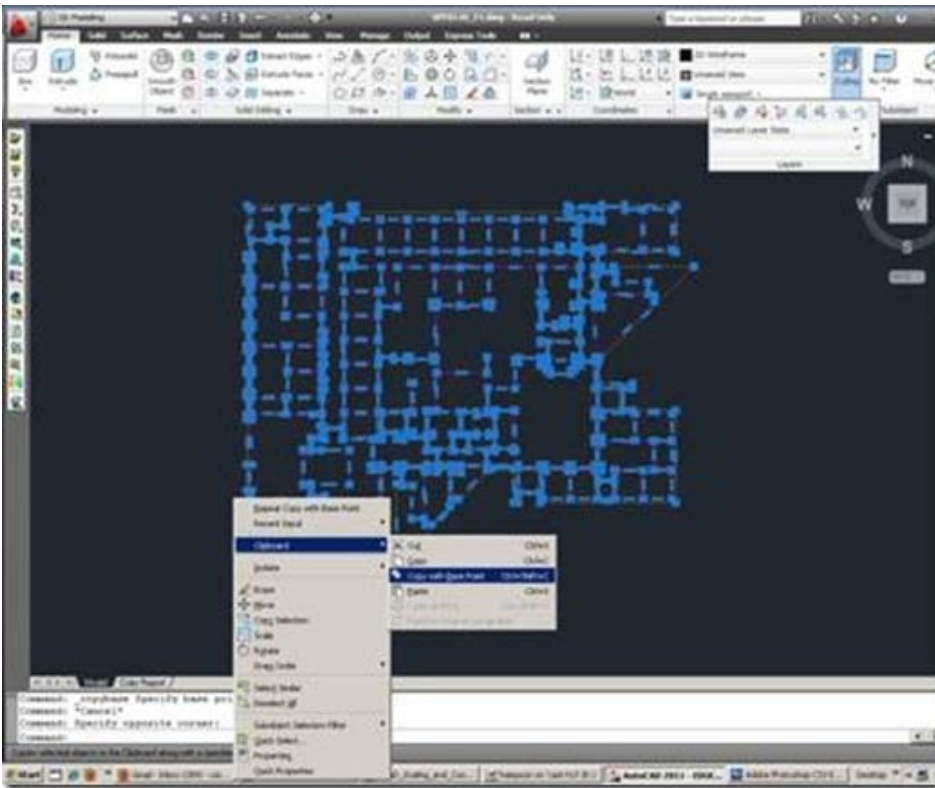
Figure 2 – Objects are selected and copied

Figure 3 – Magenta box highlights the base point as it is defined by the user

D. Paste object(s) into reference drawing (ie: paste individual floor plan into campus plan) > Zoom into location for placement (reference object) > RC > Clipboard > **Paste as block** > LC at point that you want to place the base point defined in Step C

E. Align copied block object to correspond with reference object

    1. Select block object

    2. Command line: ALIGN

    3. Prompt to specify the first source point – Select the original base point from previous steps

    4. Prompt to specify the first destination point – Select the **same original base point** from previous steps

5. Specify second source point – select a significant point on the reference object

6. Specify second destination point – select the point on the block object which you want to correspond with the source point in Step 5
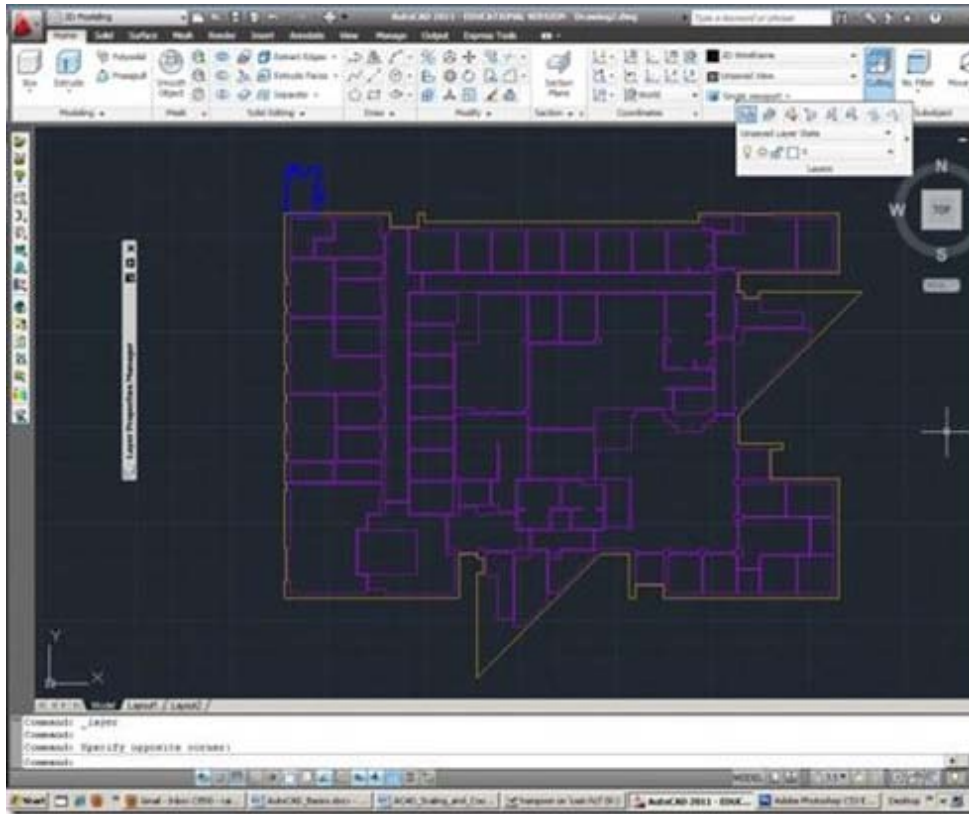
7. Click ENTER **twice**

Figure 4 – The small blue polygon represents the reference object; the magenta and yellow polygons represent the copied block
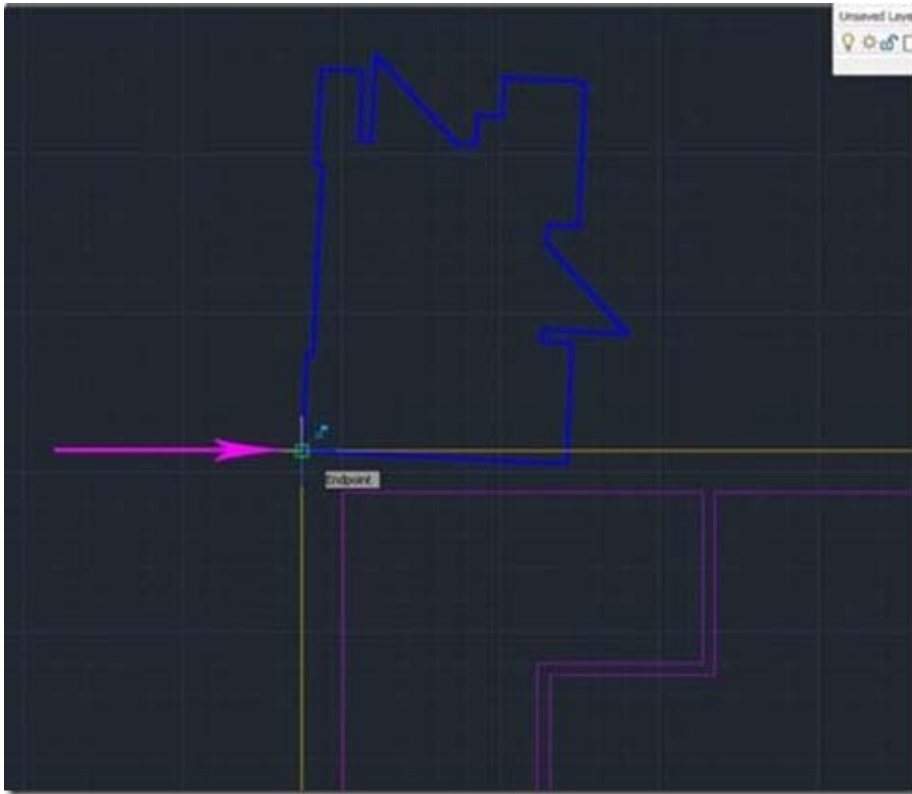
Figure 5 – The base point (here, the lower left corner on both the reference and the copied objects) is selected twice as both the source and the destination point

Figure 6 – A significant point on the block object is selected for the 2nd source point – here, another corner is used
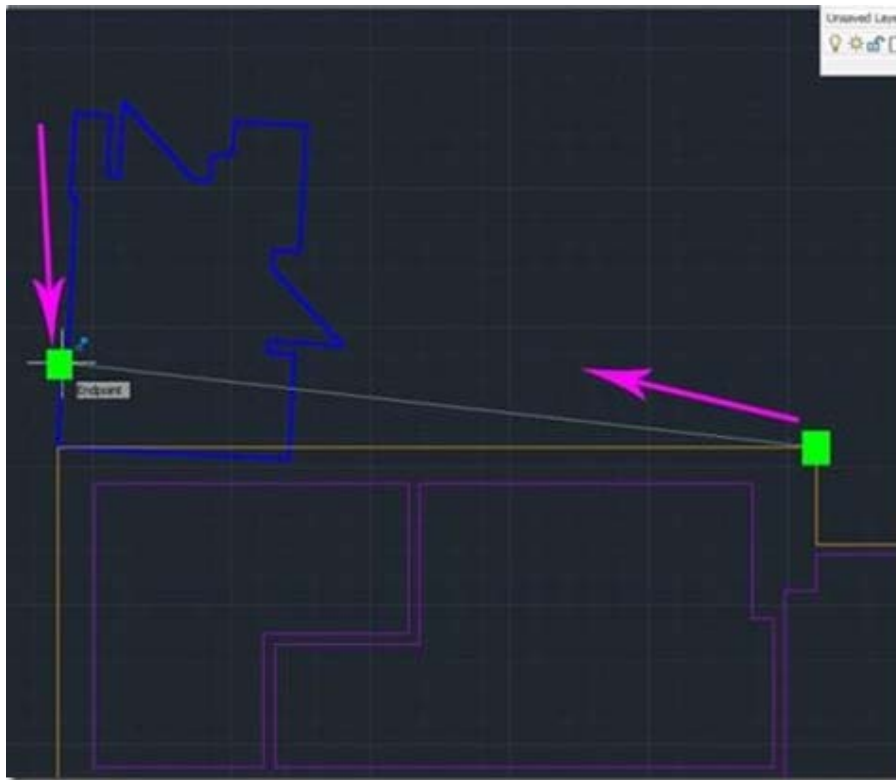
Figure 7 – The same significant point on the reference object is selected for the 2nd destination point – NOTE: the exact point does not need to be selected on the reference object but it must be accurately selected along the axis or line to which you want to align
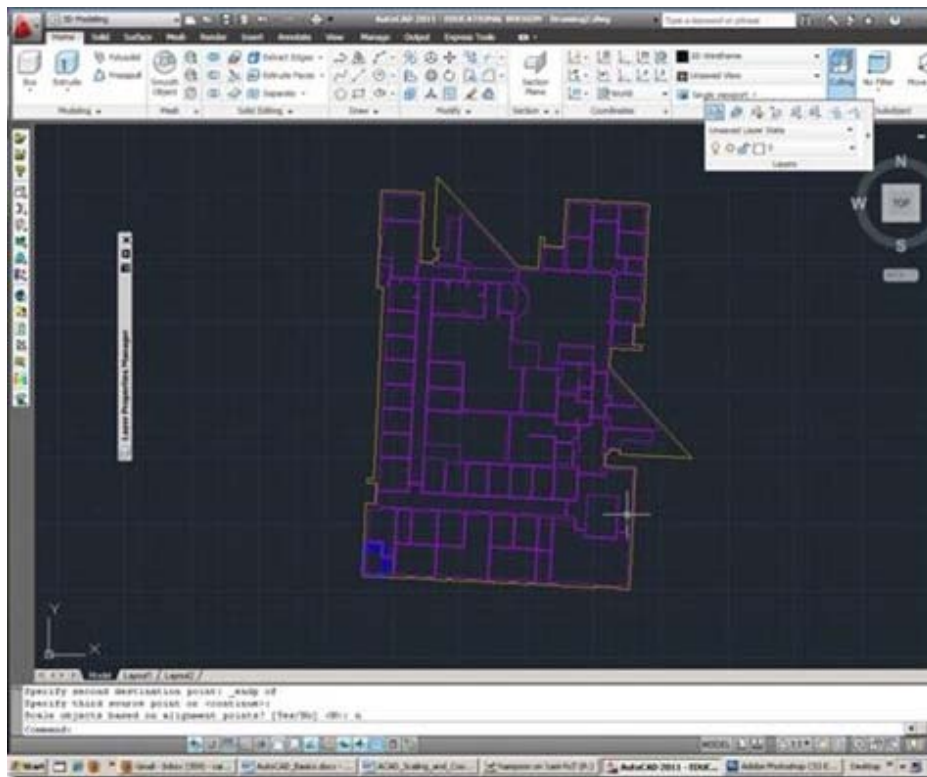

Figure 8 – The copied block (the magenta and yellow polygons) is now aligned to the reference object (the small blue polygon)
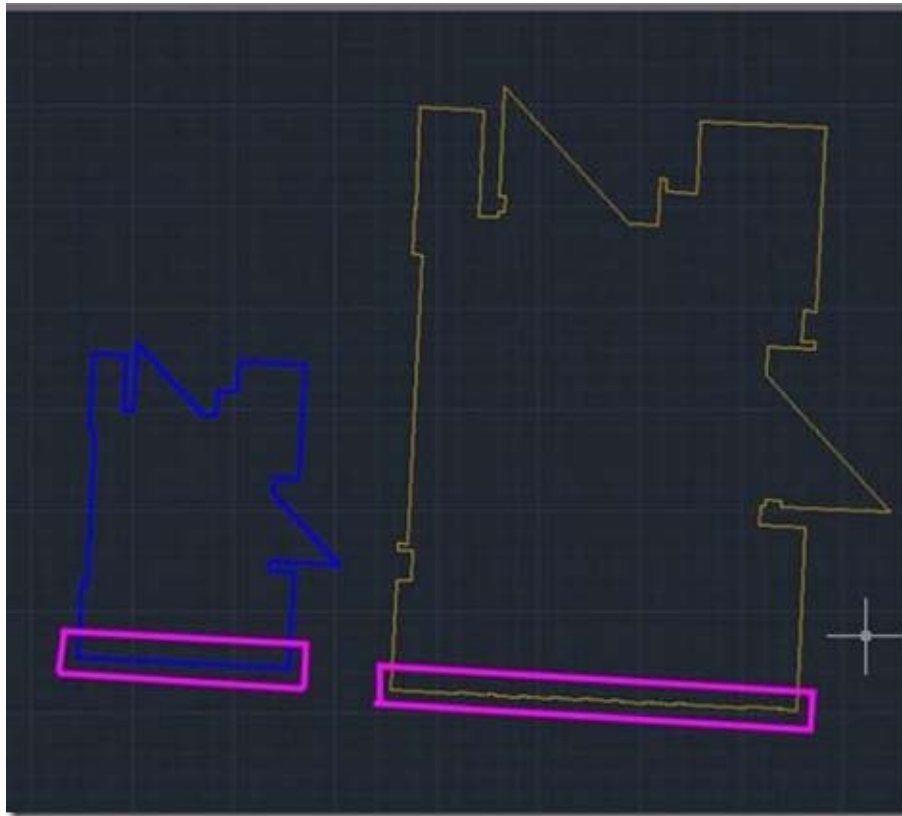
Figure 9 – The same length of wall (highlighted with the magenta boxes) will be used to scale the block object (yellow) to the reference object (blue) – NOTE: To scale to a reference object, the objects must be aligned as outlined in the previous step; the objects have been separated here for explanation only.

F. Scale the block object to the scale of the reference object – we will use a significant feature on the reference object (in this case the length of a wall) to scale the block object. A significant feature has an easily identifiable start point and end point, which we will use to re-define the length of the block object. NOTE: ACAD uses the term 'reference length' in the command prompt- this is only applicable when the command is active and should not be confused with the reference object/drawing we have been using:

    1. Select block object

    2. Command line: SC or SCALE

    3. Specify base point > LC to select original base point from previous steps (**see Figure 10 – Selection 1**)

    4. Specify scale factor > command line: R or REFERENCE

    5. Specify reference length > This is the significant length (wall) on the object being scaled and must be defined by selecting the start point and the end point

        a) Select the start point – here it is the base point from previous steps (**see Figure 10 - Selection 2 is the same point as Selection 1)**

        b) Specify the 2nd point/endpoint of the significant length (see Figure 10 – **Selection 3**)

    6. Specify new length > This is the end point on the reference length, which is defined by the new endpoint only (see Figure 10 – **Selection 4**)

    7. The block object (individual building) and reference object (campus map building) should now have the same scale and orientation

    TIPS: If object is not scaling correctly, confirm that automatic settings within ACAD are not active and

interfering. See the toolbar at bottom of screen (where OSNAPS icon is located) – confirm that the following settings are **OFF** Infer Constraints

Polar Tracking

Object Snap

Tracking

Dynamic Input

Clicking on the icon toggles it on/off, which is noted in the command line – click on each icon listed and confirm it is off
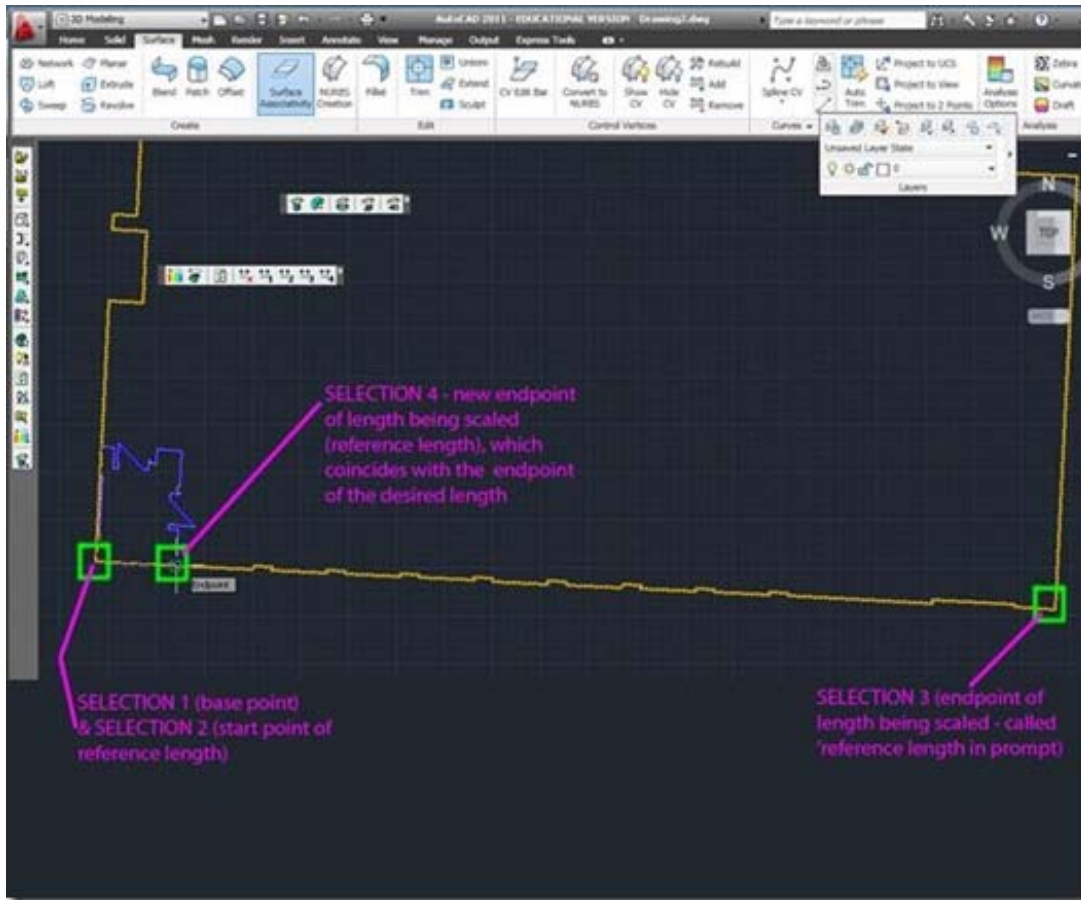

Figure 10 – Scaling the block object using a reference length – Selection 1 (base point) and Selection 2 (the start point of reference length) are the same point; Selection 3 is the endpoint of reference length (ie: the length being scaled); Selection 4 is the desired new endpoint of the length being scaled

II. Adjusting the Coordinate System and Saving as an Individual Drawing

In the previous steps, the block object (individual building) was aligned and scaled to match the reference drawing (campus map). When the block was placed in the campus map, it was placed into the map's coordinate system. By using the drawing origin (point 0, 0, 0 which is coincidental in all drawings) we can now create a new drawing with the same coordinates as the campus map so that scaled, aligned, and properly coordinated buildings can be saved individually.

A. Create a new drawing > Adjust the units to match the reference drawing (here campus map drawing is in Architectural Units > 1/16" Precision) > See ACAD Basics for more on Units

B. In the Reference Drawing (campus map) > RC > Clipboard > Copy the block object (individual floor plan) with base point > Base Point 0,0,0

B. In the new drawing created in Step A > RC > Clipboard > Paste to Original Coordinates > Command Line: ZE (Zoom Extents)

C. The floor plan is now scaled, aligned, and in the proper coordinate system with the Campus Map > Select block object > Command Line: EXPLODE > The floor plan is no longer grouped but is again composed of individual polylines

D. Command Line: Save As > Under files of type, use rolldown to find AutoCAD 2007 .dwg > Save and close