**Youth Explore Trades Skills Design and Drafting – 3D Modelling (Architectural CAD)**

# Symbols and Standards

## Description

In this activity the teacher will give an orientation to the symbols and conventions of Architectural CAD. Industry common symbols are used for most of the fixtures and hardware that go into any building, and these can be either drawn by the designer or accessed through the Internet.

## Lesson Objectives

The student will be able to:

* Define blocks
* Explain what standards are
* Draw their own symbols
* Copy the symbols and place them in a drawing with correct orientation
* Use the stretch command to pull windows to the correct size
* Save the block as a drawing for insertion into the building drawing in Activity 12: Drawing of a Simple Building (Architectural CAD)

## Assumptions

The student will:

* Know how to login to a computer and open up the software
* Know how to save the drawing as a named file in their own directory
* Have been introduced to the basic commands for drawing 2D objects

## Terminology

**Block**: a predefined architectural object that is made or found within a library on the computer, on the network or the Internet. Blocks are available for all aspects of design regardless of specialty

of the designer.

**Scale**: a drawing that is enlarged or reduced from its original size, usually expressed as a fraction in imperial measurement. The most common architect’s scale is ¼ inch to the foot, expressed

as Scale ¼" = 1'-0". In metric measurement, scale is expressed as a ratio (e.g., 1:50, meaning 1 mm in the drawing equates to 50 mm in the actual work). The actual building measure would be multiplied by the scale factor.

**Standard**: an industry-agreed use of units (whether imperial or metric), drawing layout, layer conventions, line types, dimensioning, and plot styles.



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**Standards**: industry-agreed ways and means for the use of designers to have a common language for common objects and rules used in all drawings.

**Stretch command**: used to pull objects from the length they are drawn to a desired length, longer or shorter. For example, if a wall in the drawing of a building must be stretched to make it 2' longer, the portions of the wall that need to be stretched are picked, a base point (usually an intersection on the wall) is picked, and then using polar linear directional command (e.g., @2'>0), the wall can be lengthened this precise amount.

**Trim**: where lines, circles, and all other linear objects intersect and cross over each other in a manner that is not desired, the excess portion of the lines can be trimmed using the Trim command.

## Estimated Time

60 minutes

## Recommended Number of Students

20, based on *BC Technology Educators’ Best Practice Guide*

## Facilities

Computer lab installed with CAD software (Google SketchUp, AutoCAD, Cadopia, Vector works, etc.) and Internet access

## Tools

Projector with computer and speakers installed with CAD software

## Materials

Student activity handout with instructions

## Resources

#### Instructional video for teacher and students to follow:

* + 11.1: Changing Your Model Space
  + 11.2: Drawing Architectural Blocks for a Building

**About Unit Conventions—Autodesk AutoCAD**

**Explanation of some of the conventions for measurement**  https://knowledge.autodesk.com/support/autocad/learn-explore/caas/CloudHelp/cloudhelp/2016/ ENU/AutoCAD-Core/files/GUID-FD3A36E1-FC7F-43CB-B7B5-1806FAAC12B2-htm.html

### Architectural Symbols

**A good example of a simple set of blocks**  <http://cms.cerritos.edu/uploads/dmussaw/symbols.pdf>with permission from: David Mussaw, Cerrito College, California.

## Teacher-led Activity

The intent of the teacher-led activity is to demonstrate the setting up of the model space in the correct architectural format to ensure the blocks are drawn to the scale of the drawing. The following should be demonstrated:

* + Projecting the completed drawing (Figure 1)
  + Mouse movement (scroll in/out, right/left buttons, pan)
  + Command line: inputting commands (zoom, limits, grid, etc.)
  + Coordinate entry and the line command (absolute, relative, polar)
  + Use of a pick window (right click and hold). If the pick window is green (in AutoCAD 16), multiple objects can be selected by just touching them with the window. If the pick window is blue, the objects must be wholly inside the window.

## Student Activity

Students will follow the student activity and draw their own set of blocks, then save that drawing for insertion into the small shed drawing in the Drawing of a Simple Building (Architectural CAD) activity. This will be done after the small shed file has been started and the drawing has been set up with the correct units, limits, Dimstyle, grid, and snap.

## Assessment

Assessment will be on a “done or not done” basis. The student must have completed all the symbols required:

* + Door symbol
  + Light fixture
  + Outlet fixture
  + Window

The file must be saved and/or printed with the student’s name inserted in the drawing using the text tool.

### Important Note

It is easily possible for students to copy each other’s work and resave the file under their own drive and file name. It is important that students save the block drawing with their first name included in the file name.

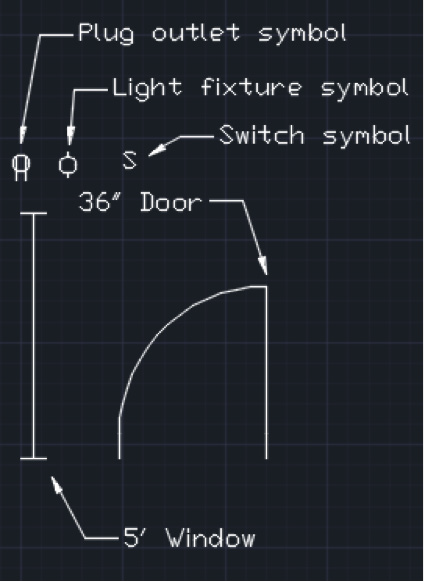
If the teacher suspects that a student has copied the drawing file from another student, follow the procedure below. This applies for all recent versions of AutoCAD.

* + Have the suspected student open their file, if it is not already open.
  + Type the word time.
  + The drawing editing time will be displayed.
  + If the time is mere minutes or less than an observed time of other students, then the teacher would have evidence of cheating/copying. The student would then have to start the drawing again from scratch or take a zero mark on the activity.

# Student Activity

Using the software, create the drawing and produce your own architectural blocks using the drawing set-up and the commands that have been demonstrated to you. In this activity and in the small shed drawing in the Drawing of a Simple Building (Architectural CAD) activity, all units will be done using imperial measurement. The settings for the drawing will be architectural in the units dialog box and the dimstyle dialog box.

Your assignment is to draw all of the drafting symbols found in Figure 1 below (you do not need to draw the labelled leaders).



**Figure 1**

1. Switch symbol. A switch symbol is just the letter S inserted as a text object. The height of the text should be 4". Type **TEXT**. Follow the prompts by pressing **Enter** for each one until you get the prompt to click on the location where you want the S to be placed. Three- and four-way switches are noted with superscripts, for example **S3** and **S4** in AutoCAD 16 or by

typing the number **S3** or **S4** in the same text entry box in other versions of AutoCAD or other software packages.

1. **Door symbol**. The door symbol is made with a 36" vertical line. The arc of the door is made by using the circle command. The centre of the circle is started at the bottom end of the

line with a radius of 36". A line must be added to trim out three-quarters of the circle. This is done by drawing a line starting at the bottom end of your first line and drawing it horizontally through the circle any distance. Type **TRIM**, press **Enter**, select the lines and the circle,

and press **Enter**. Then pick the parts of the circle you want to trim out and delete the extra line. Two vertical lines 6" long should be added to the end of the arc and the base of the door to represent the thickness of standard walls as they are in all new frame construction (Figure 2).



**Figure 2**—Lines from the door symbol extend to represent the thickness of the wall

1. **Light fixture symbol**. A light fixture symbol is just a 4" circle with line parts at the north and south ends of the circle. This is done by drawing two vertical lines starting at the centre of the circle for a distance of about an inch outside the circle. Copy the whole object and place it away from your light fixture, as you will be using it to make your outlet symbol. The interior of the lines can be trimmed out using the Trim command.
2. **Outlet symbol**. With the copy of the light fixture, use the Offset command to offset the centre lines of the light fixture 1" on either side of the centre line. Type **OFFSET**, pick the two lines in the centre of the circle (it looks like one but you know there are two), press **Enter**, then enter the distance of 1" (be sure to put in the quotation mark). Press **Enter**, then pick

on each side of the original line and there will be the two lines for the outlet. Delete the extra centre line (Figure 3).

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| --- | --- | --- | --- |
|  |  |  |  |
| **Figure 3**—Steps involved in creating the outlet symbol | | | |

1. **Window symbol**. This is the simplest style for drawing windows, though there are others. Draw a 6" horizontal line. Offset this line the length you want the window to be, using the Offset command; enter the distance in feet or inches. To draw the centre line of the window between the offset lines you have just drawn, type **L** for line, type **MID** for the middle of the line, pick the middle of one of your lines, and then type **MID** again and pick the midpoint of the other line.
2. To stretch the window either longer or shorter, type **STRETCH** and make a pick window around one end of the window; be sure to pick the endpiece and a bit of the centre line of the window. Press **Enter** after the selection and pick the intersection of the centre line and the end of the window. Press **Enter** and pull the pieces in the direction and in the amount you want to go. Then let the mouse drop the end of the window at the desired length.
3. Save the drawing as *myblocks.dwg*.

## Commands to Use/Learn

#### Centre point Circle

**Copy Dimstyle Grid Limits Line Midpoint Move**

**Offset Osnap Print / Plot Snap**

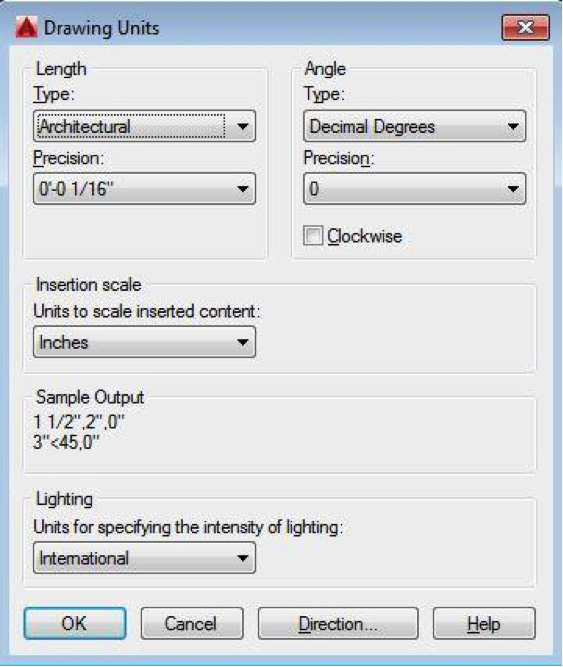
**Text Trim Units Zoom**

**Procedure**

1. Open up a new file in your CAD software.
2. Set units to “Architectural” (Figure 2). As in the included images at the end of the activity.
3. Set your Grid to 2" and your Snap to 6".
4. Limits: set up 0,0,0 and upper right corner 32',24'
5. Units (Figure 4), Print / Plot (Figure 5), and Dimstyle (Figure 6) MUST be set to the values in the screen captures. Look at the figures and set them carefully in AutoCAD. All other default settings are satisfactory, though they can be changed if required.

**Units Window**

Set “Type” to “Architectural” (Figure 4).

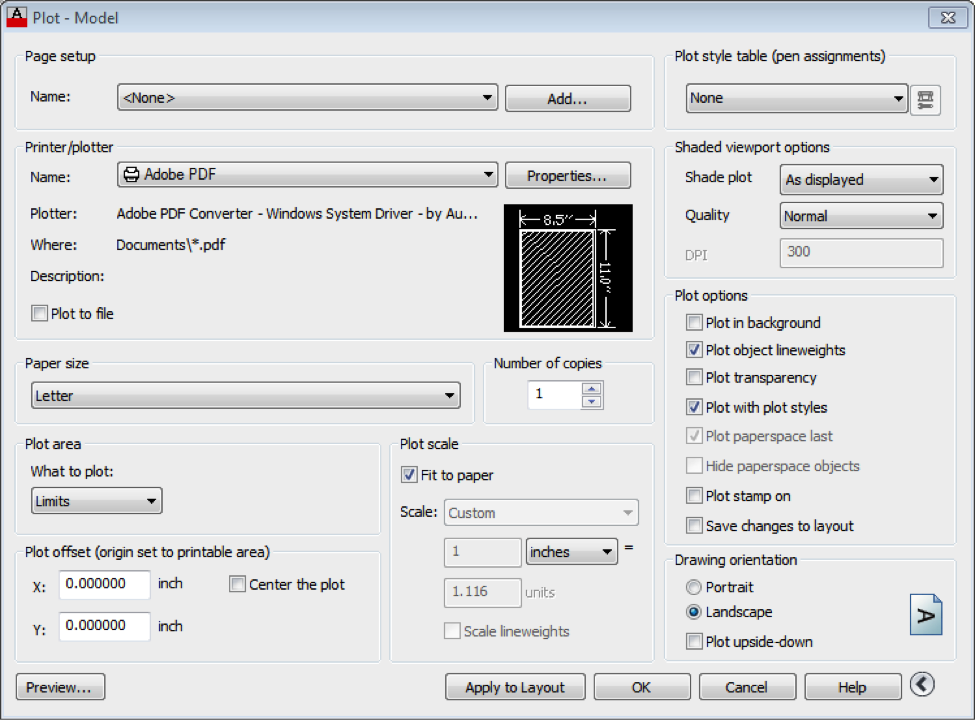


**Figure 4**

### Print/Plot Window

Use the print/plot window when you want to print your drawing. In this case, the plot is set

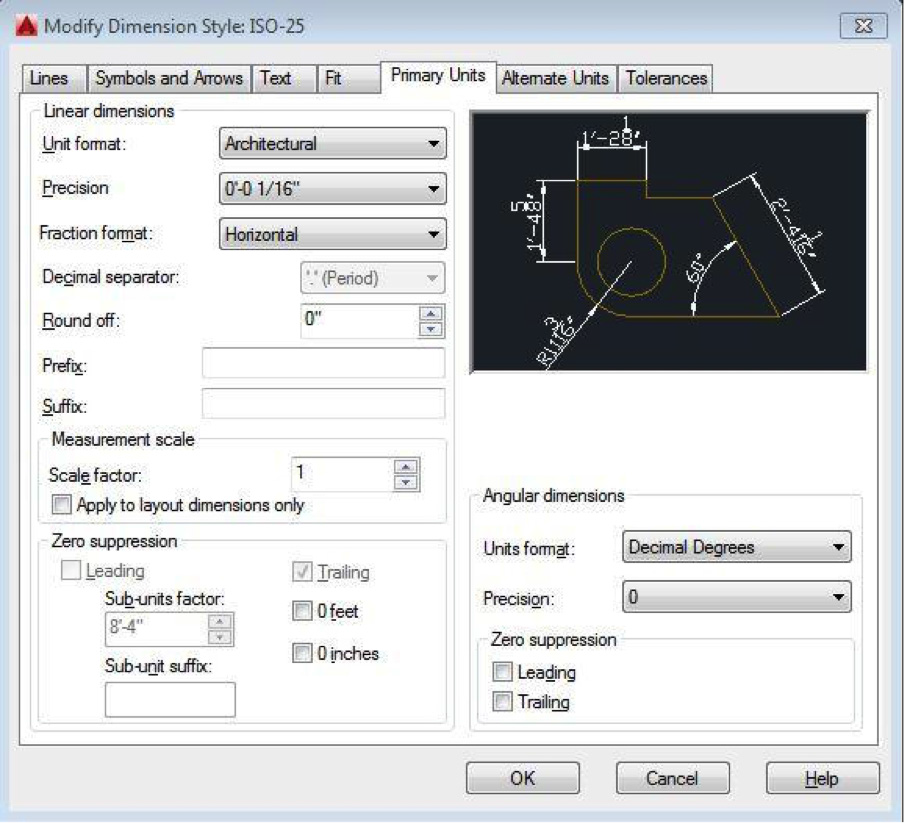
to save to a PDF file. Otherwise, you can print to your local or network printer by selecting it in the “Printer/plotter” name list. Do not forget to set the orientation to “Landscape” and the “What to plot:” to “Limits” to plot to a standard letter-size paper (Figure 5).



**Figure 5**

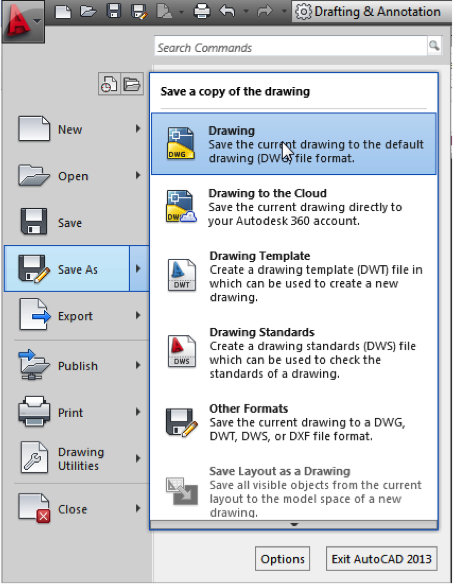
### Dimstyle Window

Set “Unit format” to Architectural in the Primary Units tab (Figure 6). Also go to the Fit tab and change the “Use overall scale of” to 32 to reflect the fact you have scaled up your limits to 32' by 24' from the 11" by 8.5" used in the Draw Your Border activity.

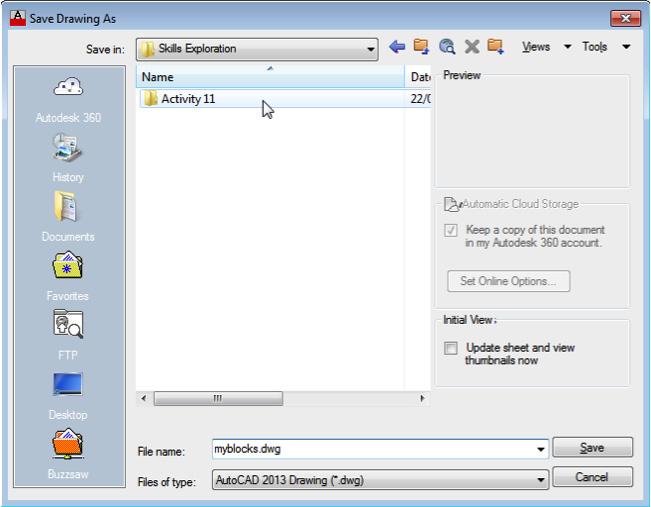


**Figure 6**

1. When you are finished, save the file. You will be able to open this file later for other assignments to use the symbols. To save, select “Save As” from either the Application Menu or the Quick Access toolbar in the upper-left corner of the program (Figure 7). When the “Save Drawing As” window opens up, navigate to the folder where you save your work. Save your work as “myblocks.dwg” as shown (Figure 8).



**Figure 7**



**Figure 8**