Overview

A drawing that shows a section of an object or a group of objects is very useful to see exactly what is happening inside. External views are important, but they often do not allow you to view the internal construction of parts. Sectional views also allow you to see how parts go together.

When you create a sectional view, you are actually cutting through the object or objects. Any solid object that is cut is typically shown with a hatch pattern. A hatch pattern may be as simple as a group of parallel lines at a 45° angle, or a pattern can be a complex pattern that indicates the type of material that is being cut.

The Challenge

For this assignment, you will use AutoCAD to create a typical wood frame wall section with a brick façade. You will first draw the components of the wall section, and then you will create hatch patterns for the different materials. Refer to the last page of this assignment to view the wall section.

If you do not understand or you have problems with AutoCAD commands, use the Help function before asking another student or your teacher for help.

The Way

Drawing Setup

1. Create a new AutoCAD drawing.
   a. Create a new AutoCAD drawing and use acad.dwt for the template.
   b. Name your file: Block_6-1-Wall-Section.

2. Set up your drawing Units.
   a. Start the Units command.
   b. Set the units to Architectural.

3. Set up your drawing Limits.
   a. Start the Limits command.
   b. Set the lower left corner to 0,0 and the upper right corner to 17',11'.

4. Set the Text style.
   a. Enter the Text Style dialog window and make sure Standard is the current text style.
   b. Set the Font Name: to Simplex.shx.

5. Set Grid and Snap
   a. Set your Grid to 4”.
   b. Set you Snap to ¼”.

6. Create new layers
a. Open the **Layer Properties Manager**.

b. Make the 9 new layers listed in the table below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Color</th>
<th>Linetype</th>
<th>Lineweight</th>
<th>Plot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batt</td>
<td>Pink (11)</td>
<td>Continuous</td>
<td>0.13 mm</td>
<td>Yes</td>
</tr>
<tr>
<td>Earth</td>
<td>Green (104)</td>
<td>Continuous</td>
<td>0.13 mm</td>
<td>Yes</td>
</tr>
<tr>
<td>GWB</td>
<td>Purple (212)</td>
<td>Continuous</td>
<td>0.13 mm</td>
<td>Yes</td>
</tr>
<tr>
<td>Masonry</td>
<td>Gray (8)</td>
<td>Continuous</td>
<td>0.13 mm</td>
<td>Yes</td>
</tr>
<tr>
<td>Text</td>
<td>Cyan</td>
<td>Continuous</td>
<td>Default</td>
<td>Yes</td>
</tr>
<tr>
<td>Titleblock</td>
<td>White</td>
<td>Continuous</td>
<td>Default</td>
<td>Yes</td>
</tr>
<tr>
<td>Viewport</td>
<td>White</td>
<td>Continuous</td>
<td>Default</td>
<td>No</td>
</tr>
<tr>
<td>Wall</td>
<td>White</td>
<td>Continuous</td>
<td>0.35 mm</td>
<td>Yes</td>
</tr>
<tr>
<td>Wood</td>
<td>Brown (30)</td>
<td>Continuous</td>
<td>0.13 mm</td>
<td>Yes</td>
</tr>
</tbody>
</table>

c. Set the **Wall** layer as your *Current Layer*.

7. **Zoom-All** to view your drawing.

---

**Draw the Wall Section**

Your final wall section drawing will contain 4 basic things: the wall section, hatching, labels and a title block. The first thing you need to draw is the wall section itself, which is shown on the following page. Drawing the wall section may seem complex, but it is really a matter of drawing the individual parts and putting them together. It is something like building with Legos.

1. On your own, draw the wall section as shown on the following page. **Do not** draw any dimension or notes. Read the suggestions below before attempting to draw the wall section.

2. Suggestions for drawing the wall section:
   a. Use the **Line** or the **Rectangle** command to draw the parts. The only exception is the 4” **High Base** which has a rounded top. Here you can use either the **Arc** command or the **Fillet** command.
   b. Be sure to use the **Offset, Trim and Extend** commands frequently.
   c. Most of the dimensions are listed in the labels. Be sure to read the labels carefully.
   d. If an object does not have any dimensions, then you may estimate the size. The shingles on the roof is an example where you simply estimate the size.
   e. Do not draw the triangle above the roof. This is showing you that the roof has a **rise to run ratio** of 4:12. This means that for every 12” horizontally, the roof will rise 4”.
   f. To draw the roof, first draw the **double top plate**. Now start the **Line** command and select the upper right corner of the **double top plate** for the first point. For the second point, type the following **relative coordinate**:
      @12.4 and Enter. This line will give you the proper slope. Now you can use the **Offset, Trim and Extend** commands to draw the remainder of the roof.
Modify Line Type

AutoCAD provides many line types that can be used. Up to now, you have only used one line type, continuous. This line type is a basic solid line. However, there will be many occasions when you will need another line type, such as a dashed line. In technical drawings, a dashed line typically means that that line is hidden from view. Dashed lines are also useful to show that an object is beneath another object.

1. Zoom in the roof area as shown below.

2. Load a dashed line type. Even though AutoCAD provides many types of lines, you must first “load” the line type that you want before you can use it in your drawing.
   a. Click on the drop-down list for line types under Properties on your Home tab.
   b. Select Other…
   c. On the Linetype Manager, click the Load… button.
   d. On the Load or Reload Linetypes dialog window, find and highlight the linetype Hidden2, and click OK.
e. Click **OK** to leave the **Linetype Manager**.
f. Select the two lines shown below.

![Select Lines](image)

g. Select the line type **Hidden2** from the **Line Types** drop-down list. You can also use the **Quick Properties** dialog box.

![Line Types](image)

h. You may not see a change yet. This is because the **Line Type Scale** needs to be set to your plot scale. To change the **Line Type Scale**, type the command **LTS** and Enter.

i. For the prompt, *Enter new linetype scale factor*, type **12** and Enter. (This means that you will be printing at a scale of 1” = 1’-0”.)

![Line Types](image)

j. Select both dashed lines, right-click and select **Properties**.
k. Set the **Lineweight** for the dashed lines to **0.18mm**. This will ensure that the hidden lines will plot using a very thin line.
Create Hatching for the Ground, Footing, Sill and CMU

Any solid object that you cut through to create the section will likely need some type of hatch pattern. The hatch pattern that you use is determined by the material that you cut through. Before you create the hatch, set up your OSNAP settings.

1. Set up your OSNAP setting.
   a. Right-click the OSNAP button in the status bar, and select Settings...
   b. Check the Object Snap modes for Endpoint and Intersection. Leave the other object snap modes unchecked.

   ![Drafting Settings](image)

   c. Use Zoom – Window to view the footer and foundation area.

2. Create a Polyline using the following points as your guide (you do not need to be precise). When you click the 9th point, type C to close the boundary.
3. Create a **Hatch** selecting objects.
   a. Set your *Current Layer* to **Earth**.
   b. Open the **Hatch** ribbon by selecting the Hatch command on the Home tab. (Simply typing h – Enter will also work.)
   c. For the *pattern*, select **Earth**
   d. Set the *angle* to 135 and the *scale* to 12.
   e. Uncheck the *Associative* option. (This will allow the polyline to be deleted in the next step without deleting the hatch)
   f. Select the **Select** button.
   g. Select the **polyline** that you created in the previous step.
   h. Press **Enter** to finish selecting objects.
   i. Delete the polyline surrounding the hatch.

4. Create a **Hatch** by selecting points.
   a. Set your *Current Layer* to **Masonry**.
   b. Select **Hatch** from the *Home* tab, or type **H** and Enter.
   c. For the Pattern, select **AR-CONC**.
   d. Set the *Angle*: to 0.
   e. Set the *Scale*: to 0.5.
   f. Click on the **Pick Points** button and select the inside of the footer and the sill, as shown below.
g. Press Enter to finish selecting points.

5. Create a hatch for the CMU block.
   a. Return to the **Hatch** command.
   b. Select the Pattern called **MUDST**.
   c. Set the **Angle** to 0 and the **Scale** to 5.
   d. Click on the **Pick Points** button.
   e. Click inside the CMU Block as shown in the image below.

f. Press Enter to finish selecting points.
6. Create a hatch for the brick facade.
   a. View your entire drawing using **Zoom – All**.
   b. Select the Pattern called **SACNCR**.
   c. Set the **Angle** to 0 and the **Scale** to 10.
   d. Click on the **Pick Points** button.
   e. Click inside the brick façade for both the upper section and the lower section as shown in the image below.
f. Press Enter to finish selecting points.

Cross-Cut Dimension Lumber

Dimension Lumber is wood that are of standard sizes and used in construction. More specifically, dimension lumber is at least 2” thick but less than 5” thick. Typical dimensions include 2 x 4, 2 x 6, 2 x 8, 4 x 4, and etc.

Cross-cut means that the lumber was cut across the grain, as opposed to along the length of the board. (Cutting with the grain is referred to as a rip-cut.) When you have a section that shows the cross-cut section of dimension lumber, the section is shown with a large X. See examples shown below.

1. Show cross-cut lumber at the floor.
   a. Set the Current Layer to **Wood**.
   b. Zoom into the floor area of the wall section, as shown below.
c. Use the **Line** command to add cross-cut symbols for the dimension lumber. Be sure to **Snap** to the corners of the lumber.

2. Show cross-cut lumber at the roof.
   a. Follow the same procedure to add the cross-cut symbol to lumber in the roof area as shown below.

---

**Create Hatch for Plywood and Trim**

1. Hatch the fascia and trim board at the roof.
   a. Load the **Hatch** command.
   b. For the Pattern, select **User defined**.
   c. Set the **Angle** to 45.
   d. Set the **Spacing** to 3/4”.
e. Select the **Pick Points** button.

f. Select inside the Facia and Trim board, as shown in the drawing below.

```
---
Pick Points
---
```

g. Press Enter to finish selecting points
2. Hatch the roof deck.
   a. Restart the **Hatch** command.
   b. Make sure the hatch **Pattern** is still set to **User defined**.
   c. Set the **Angle**: to **65**.
   d. Set the **Spacing** to **3/4”**.
   e. Select the **Pick Points** button.
   f. Select inside the roof deck, as shown in the drawing below.

    ![Pick Point](image)

   g. Press Enter to finish selecting points

3. Hatch the sub-floor and the base trim.
   a. Use **Zoom** to view the floor section area. See drawing below.
   b. Restart the **Hatch** dialog window.
   c. Make sure the hatch **Pattern** is still set to **User defined**.
   d. Set the **Angle**: to **45**.
   e. Set the **Spacing** to **3/4”**.
   f. Select the **Pick Points** button.
   g. Select inside the sub-floor and the base trim, as shown in the drawing below.
h. Press Enter to finish selecting points

4. Hatch the gypsum wall board (GWB) (a.k.a. sheetrock or drywall).
   a. Set the Current Layer to GWB.
   b. Restart the Hatch dialog window.
   c. Set Hatch Type: to Pattern.
   d. Set the hatch Pattern, AR-SAND
   e. Set the Angle to 0 and the Scale to 0.25.
   f. Select the Pick Points button.
   g. Select inside the GWB for both the upper and lower sections, as shown in the drawing below.
h. Press Enter to finish selecting points
Create the fiberglass batt insulation

In all exterior walls, insulation is used to prevent the warm indoor air from escaping to the outside during the winter, or to keep the hot outdoor air outside during the summer. A popular type of insulation used to fill the inside of a wall is fiberglass batt insulation.

There is a special symbol used in section drawings to indicate batt insulation. This symbol looks like a sideways ‘S’ stacked on top of each other. Fortunately, AutoCAD provides a fairly easy method to show this symbol by using a special line type.

1. Draw the line for the bat insulation
   a. Change your Current Layer to layer BATT.
   b. Right-click on the OSNAP button and select Settings…
   c. Add a checkmark to the Osnap modes Midpoint and Perpendicular.
   d. Leave other settings as is and click OK.
   e. Zoom to the upper section from the ceiling to the break line as shown below.
   f. Draw a Line from the center of the top of the wall to the break line. Be sure that the line is precisely in the middle of the wall.
   g. Pan down to view the lower half of the section.
   h. Repeat the previous steps to add the line to the middle of the wall as shown in the drawing below.
2. Change the layer line type
   a. Open the **Layer Properties Manager** to view your layers.
   b. For the **BATT** layer, click on **Continuous** in the **Linetype** column. This should open the **Select Linetype** dialog window.
   c. You need to load the line type for the batt insulation, so click on the **Load…** button.
   d. In the familiar **Load or Reload Linetypes** dialog window, scroll down and select the line type called **BATTING**.

![Select Linetype Dialogue Box]

   e. Click **OK** to return to the **Select Linetype** dialog window.
   f. Highlight the **BATTING** line type and select **OK**.

![Load or Reload Linetypes Dialogue Box]

   g. Close the **Layer Properties Manager**.
h. You should notice that the lines that you drew in the middle of the walls changed appearance, but they are much too big.

i. Select the two bat insulation lines.

j. Right-click and select **Properties**.

k. Change the **Linetype Scale** for the two lines to **0.35**.

---

**Submit**

Now it's time to save and submit your AutoCAD drawing to your instructor.

1. Place your name in the lower right corner. Use the **Standard** text style, and draw your text 3" high.

2. Print your drawing on 8.5" x 11" sheet in **Protrait Mode** and submit to your instructor.

3. Save your drawing and submit it through the **MyCourses drop box**.