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You are viewing sample pages from our textbook:

"***The MicroStation Lab Book 2D Level 2.***"

The first ten pages of Module 10 are shown below. The first two pages are typical for all Modules - they provide the Module title and set out the learning objectives. The suggested time for completion of the Module is given at the end of Page 10-2.

The instruction you see is typical of the combined information and exercise approach used throughout all Modules.

Please note the "Tool Tip" boxes on various pages; these are located throughout the Manual to emphasize a technique or to add specific points of information.

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MicroStation - 2D

LEVEL 2

Module ***10***

PATTERNING

Micro-Press.com

24 Pimlico Drive
Dundas Ontario Canada
L9H 6J5
Phone 905-628-8237

Module Information

Prerequisites:

Module 9 MicroStation - 2D Level 2

Introduction:

Patterning or hatching is a very important part of the drafting process. It is used to add material or textural information to a drawing in the form of hatch lines or patterns of symbols. Every discipline uses patterns of some kind; engineering drawings show cut materials with hatches, surveying drawings show ground cover symbols, and geological drawings show rock material types as patterns. As you will see, MicroStation uses lines and cells to create hatches and patterns, and you will use the concepts discussed in the previous Module to create boundaries to contain the hatches and patterns.

Objective(s):

10.1 Draw single-line hatches using the *Hatch Area* tool.
10.2 Draw double-line hatches using the *Place Crosshatch* tool.
10.3 Discuss the seven *Methods* of placing a pattern.
10.4 Place cell patterns using the *Pattern Area* tool.
10.5 Manipulate the level, color, weight, and display of patterns.
10.6 Place associative patterns and discuss their implications.
10.7 Delete patterns using the four pattern deletion tools.
10.8 Discuss methods of patterning around holes.
10.9 Use the *Show Pattern* and *Match Pattern Attributes* tools.
10.10 Discuss the options for the *Linear Pattern* tool.

Time:

This Module should be completed within 4 hours.

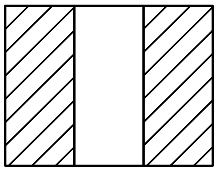
DISCUSSION:

MicroStation provides two basic methods of adding hatching or patterns to drawings:

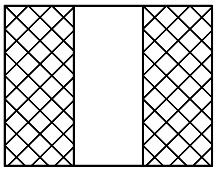
Line Elements Simple *hatching* is achieved by applying either *single-line* (hatching) or *double-line* (crosshatching) elements to a defined area.

Cells *Patterning* is achieved by applying a *pattern cell* to a defined area.

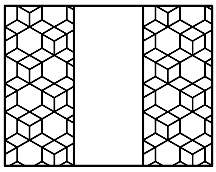
The three three types of patterns look like this:



Single-Line Hatch



Cross Hatch



Pattern Cell

The terms *hatch* and *pattern* are essentially interchangeable, although *Patterning* is the official MicroStation term. In this Module I am generally using *hatch* to describe *line* patterns, and *pattern* to describe patterning with a *cell*.

For a hatch or a pattern to be successfully applied there are two statements that can be made:

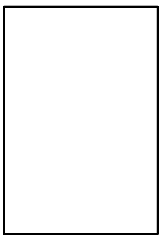
Ideally, the *geometry* of the drawing elements should be as *accurate* as possible. Accuracy in this case means having the *vertices* of the enclosing elements *connected*. Nothing will stop the patterning process faster than a *gap* between enclosing elements!

For most of the hatching or patterning tools, MicroStation requires there to be *closed elements* present before a pattern will take place. This is particularly so if the pattern is to be *associative* (where the pattern is bound to the closed element). Depending on the method used, *you may need to create closed elements before starting the patterning process*.

Let's start the instruction with a simple single-line hatch, and then look at the process in greater depth :

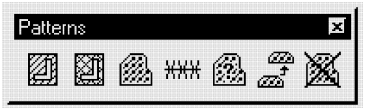
10.1 SINGLE-LINE HATCHES

Start by drawing a *closed* shape:



Step 1 Start the *Place Block* tool and draw a rectangle with dimensions of 3'-0" (900) high, by 2'-0" (600) wide.

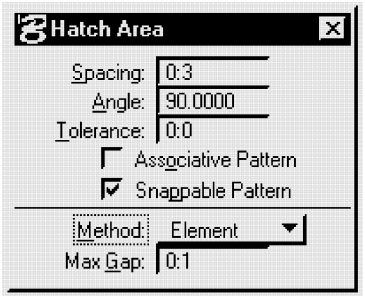
Step 2 Start the *Hatch Area* tool on the *Pattern* tool box. 



Look at the *Tool Settings* window. The options are:

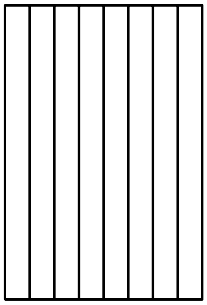
Spacing	Sets the *spacing* of the hatch lines in *working units*.
Angle	Sets the *angle* of the hatch *lines* (standard counterclockwise rotation).
Tolerance	Controls how closely MicroStation draws hatch lines to curved boundaries. If you have a large hatch inside a curved boundary, setting a tolerance value will increase hatch speed.
Associative Pattern	If ON, associates the hatch to the boundary element. Associated hatches are edited if the boundary element is edited. E.g., if the boundary is stretched, so is the hatch.
Snappable Pattern	If On, allows snapping to the hatch lines. Normally this option is off since a dense hatch can interfere with snapping to elements near the hatch.
Method	A choice of seven methods of applying a hatch.
Max. Gap	If the *Flood* method of placing a hatch is selected, you can set a Max. Gap value that will allow MicroStation to "jump" a gap between vertices of bounding elements. MicroStation insets a line element to close the gap.

Step 3 *Set* the option values to those shown in the illustration. The spacing is 3" (75).



You will use the *Element* method because the block you drew is a closed element. Follow the prompts in the *Status Line*:

Step 4 *Data-point* to select the block.



The next prompt is to *Accept @pattern intersection point*. MicroStation is asking you to select *a point through which a line of the hatch will be drawn*. In other words, you control where the hatch is started:

Step 5 *Snap* to the upper-left corner of the block.

This will force the hatch to start at this corner. Since you have set the spacing at 3" (75), the hatch will display as vertical lines that divide the width of the block perfectly.

Step 6 *Reset* to stop the tool.

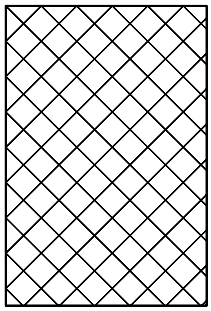
The spacing option requires some comment. Clearly, you can control the spacing value to best advantage. For example, if you were designing a deck and you wanted to see the effects of placing 6" (140) planks at different angles and starting points, it is very easy to set suitable values and place several plank layouts in copies of the deck outline. Similarly, if you are hatching a machine part and the material hatching symbol requires that the hatch spacing be 1/8" (3), you can control the spacing value so that the hatch will *plot* at 1/8" (3) at whatever plot scale you are using.

On your own, *repeat* this hatch placement process, changing the *spacing* and *angle* options and data-pointing in other locations to locate the hatch. Don't change any other options yet.

10.2 CROSSHATCHES

Crosshatches are the same as single-line hatches except that you are offered *two* spacing and angle settings:

Step 1 Start the *Place Crosshatch* tool. 



The *Tool Settings* window now offers the option of setting spacing and angle for the *second set* of hatch lines.

Step 2 *Set* values of *3" (75)* and *135^0* for the *second* hatch settings (leave the first hatch settings as they were before).
Step 3 *Data-point* to select the block.
Step 4 *Snap* to the upper-left corner to define a point through which the hatching must pass.
Step 5 *Reset* to stop the tool.

On your own, try placing more crosshatches at different spacings and angles to see the effects.

TOOL TIP !
If you set the second spacing and angle values to *zero* in the second options box, MicroStation will automatically place the second set of hatch lines at *right-angles* to the first hatch lines and at the *same spacing*.

TOOL TIP !
Hatches and crosshatches are placed as *graphic groups.* This allows you to manipulate the hatch as *individual lines* if *Graphic Group Lock* is OFF. If *Graphic Group Lock* is ON the hatch can be manipulated as a group.

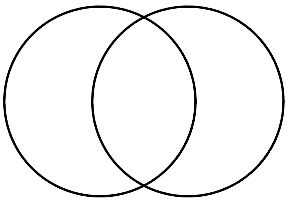
10.3 PATTERNING METHODS

Take a closer look at the *Method* option for placing patterns:

Method	Action
Element	Places a pattern inside a *closed* element, shape, or complex shape. This is the easiest method to use, provided a closed element already exists (or has already been created for this purpose).
Fence	Places a pattern inside the boundary of a *fence.* The fence can be of any shape.
Intersection **Union** **Difference**	*Boolean* tools that place a pattern in the shape created by the Boolean operation. Refer to Module 9 for Boolean operations. The *Difference* method is particularly useful when patterning around holes (discussed later).
Flood	Places a pattern inside an area enclosed by *individual elements*. Use this method if a closed element or shape is not available. The Max. Gap option will jump a gap between elements up to the value set.
Points	Places a pattern inside an area defined by a series of *data points*.

You can easily experiment with the *Fence* and *Points* methods. With the Fence method, place a fence before starting the tool. With the Points method you simply *data-point* to define the vertices of the boundary. To *close* the boundary, press the *Reset* button and MicroStation will automatically snap back to the *first point* you placed. Try both methods yourself.

To practice the three Boolean methods and the Flood method you need two new elements. Do the following:



Step 1 Draw the two circles as shown. Make them both 1'-6" (450) radius.

Step 2 In the *Place Hatch* tool set the *Spacing* to 2" (50) and the *Angle* to 45^0.

Start with the *Intersection* method:

Step 3 Set the *Method* to *Intersection.*

Follow the prompts:

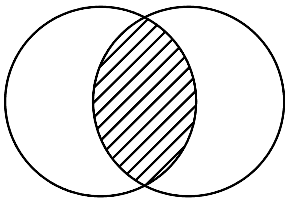
Step 4 *Data-point* on one of the circles.

Step 5 *Data-point* on the second circle.

Both circles should now be highlighted.

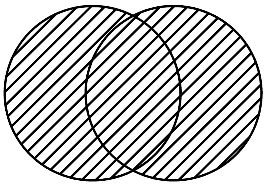
Step 6 *Data-point* to accept the two selection (a line of the hatch will be drawn through this data point).

Step 7 *Reset* to draw the hatch and stop the tool.

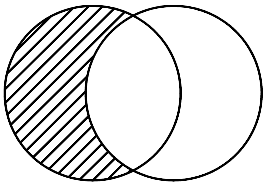


The hatch lines will display in the *intersecting* portion of the two circles.

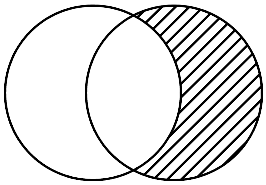
Try the same procedure with the *Union* and *Difference* methods. You should find the hatches to be similar to those shown below. There are two possible combination generated by the Difference method, depending on the order in which you pick the two circles.



Union Method

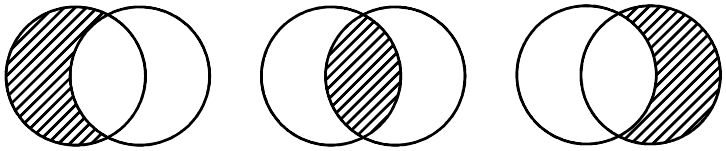


Difference Method
Left-Right Picks



Difference Method
Right-Left Picks

To apply the *Flood* method you simply data-point in the area where you want the hatch to be drawn. Remember that if the geometry is not closed you will see an error message on the Status Line. You can then connect all element vertices or set a Max. Gap value. There are three possible hatch locations using the Flood method as shown below.



Flood Method

TOOL TIP !
When using the Flood method, it is a good idea to zoom-in to the area to be patterned. This reduces the chances of MicroStation trying to pattern other than the area you have selected.

10.4 PATTERNING WITH CELLS

Patterning with cells is somewhat different to the more simple hatching with lines. The general procedure is to attach a *cell library* to the design, select a *pattern cell* as the *active cell*, and then place that cell in the area in *rows and columns* similar to an *array*.

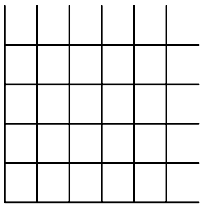
A pattern cell is really just a standard cell, but the cell can be designed to produce a pattern that fills the area without gaps. Try an example:

First, make a *copy* of the rectangular *block* you used at the beginning of this Module. Second, load a cell library (review Module 7 if necessary):

Step 1 In the *Cell Library* dialog box (*Element/Cells* menu), attach the *Archpa.cel* library to your design.

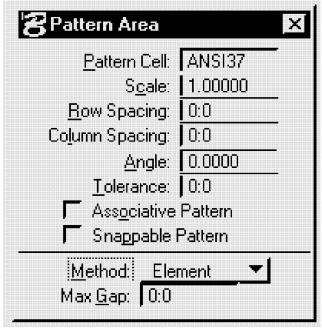
The file name, Archpa.cel, indicates that this cell library contains architectural cells for patterning.

Step 2 Highlight the *ANSI37* cell.
Step 3 *Click* on *Pattern* in the *Active Cell* box at the bottom to apply the cell to the patterning tool.



Look at the *Display* of the cell before proceeding. The cell contains line elements in a pattern that has a closed left end and bottom. The top and right of the pattern are open. If you were to place copies of the cell directly to the right and to the top, the grid pattern would be continued. This is what the patterning tool will do automatically if you set the correct *spacing size* in the Tool Settings widow.

Step 4 Start the *Pattern Area* tool in the *Patterns* tool box. 



Look at the options in the *Tool Settings* window.

The selected cell is named in the *Pattern Cell* box. You could change this to another name without going to the *Cell Library* box.

Set the scale to *1*. The cell will be placed at the size it was originally drawn.

Set the *Row* and *Column* spacing to *zero.* This will ensure that *multiply repetitions* of the cell in the pattern will be placed *end-to-end* without gaps between each cell. This is important if want a seamless-looking pattern.

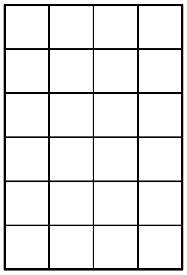
Set the *Angle* to *zero* for the moment.

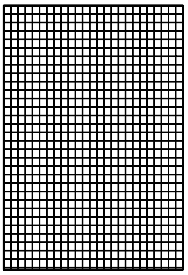
Set the *Element* method of cell placement.

Step 5 *Data-point* on the *block* to select the element.
Step 6 *Snap* to the upper-left corner of the block to start the pattern.

Step 7 *Reset* to stop the tool.

The result should be as shown at the right if you are working in English units.





If you are working in *metric* you will see a different-sized pattern in the block. Yours will look like the block at the left. This occurs because of the difference in working units between the original cell drawing and your metric file. The Section below explains the situation.

CELL SCALE AND WORKING UNITS

Although scaling between designs with different working units has been discussed before, this is a difficult subject and more discussion can only help.

When you originally draw the elements of a cell you do so in the current design's working units. Those units become part of the cell's definition. If you insert the cell into a design which has the *same* working units, then an insertion *scale* of *1* results in a cell with the *same* apparent dimensions as the original cell elements. Most cells provided by MicroStation are drawn in the standard English working units of *', ", 12, 8000.*

If you inert a cell into a design with *different* working units then the apparent scale of the cell will be different unless you compensate by changing the scale setting. In the case of your metric file with working units of *mm, mm, 1, 1000*, you must calculate the Positional Unit ratio between the English and metric files in relation to their respective Master Units:

English PUs per MU = 1 x 12 x 8000 = 96,000

Metric PUs per MU = 1 x 1 x 1000 = 1000

Ratio English/metric MU = **96**

What does this mean in practice? Well, if you have an English-unit cell that contains an element that is *1* MU long (1'-0") and you insert the cell into a metric design at a scale of *1*, you will find that the element will measure *96* mm in length. If you want the element to scale *1* mm in the metric design, you must change the insertion scale to 1/96 or 0.01042.

If you wanted the English MU (1'-0") to display as its soft metric equivalent (304.8 mm) in the metric design, you would need to do a further calculation:

Since 1 ft displays as 96 mm at a scale of 1, then the scale factor to have 1 ft display as 304.8 mm is:

$$\frac{304.8}{96} = \mathbf{3.175}$$

So, if you are working in the metric file, *repeat* the *Pattern Area* procedure on the block with the scale factor set to *3.175*. You will now find that the pattern will look similar to the English version. It won't be exactly the same because the 900 x 600 mm size of the block is not a hard metric conversion of the English block dimensions.

Time for some experimentation. On your own, place a series of patterns using different cell definitions and at different scales, spacings, and rotations. An interesting exercise is to use the *Insul* cell on the *Linepa.cel* library to pattern an area that would typically be found in stud wall or roof construction. Draw rectangles for 3 ½" (89) and 5 ½" (140) thick insulation and adjust the scale of the pattern to suit. Make note of the successful scales for future use.

CREATING PATTERN CELLS

Cells designed for patterning are created in exactly the same way as for regular cells. There are some points that you should be aware of though:

Since pattern cells are usually designed to repeat themselves seamlessly, it is important that *one full cycle* of the pattern in the horizontal and vertical directions is contained in the cell.

If you want to deliberately create *white space* around the inserted pattern when the spacing settings are set to zero, you must place *point elements* (discussed in Module 14) to expand the extent of the cell. You include the point elements in the selection set used to create the cell, but the point elements will not be visible when an area is patterned.

You cannot *nest* area pattern cells, and the maximum size of a pattern cell is 8 Kb.

An advantage to placing patterns with the *Pattern Area* tool is that horizontal and vertical lines that span the entire pattern cell are placed as continuous lines in the patterned area, not as individual lines placed end-to-end. This increases patterning speed and reduces file size.

Remember that a cell can contain any type of element, including text.

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