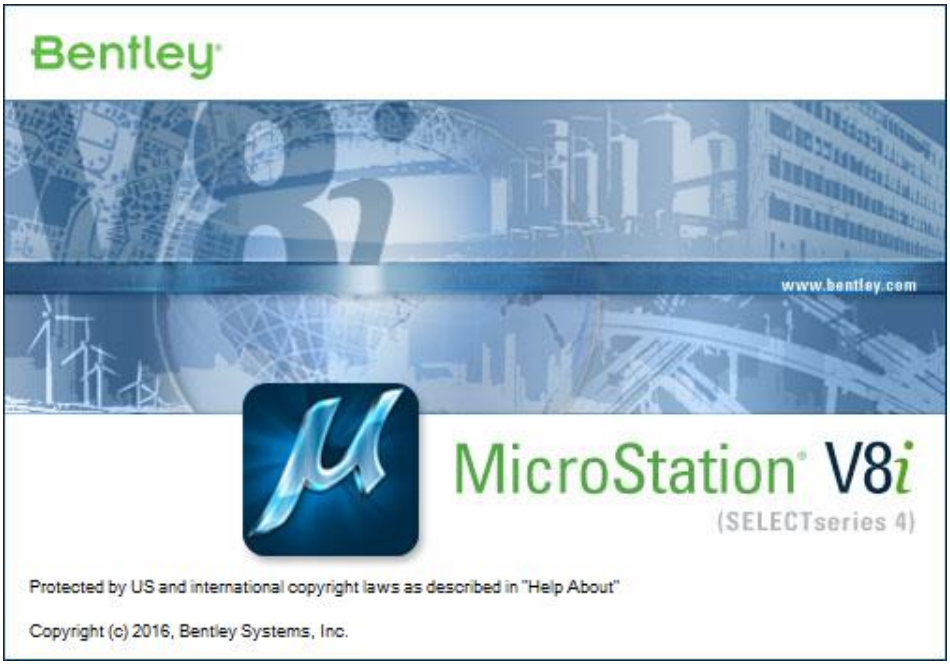
MICROSTATION® INTRODUCTION CLASS



Montana Department of Transportation
CADD Unit
Helena Montana

Spring 2019

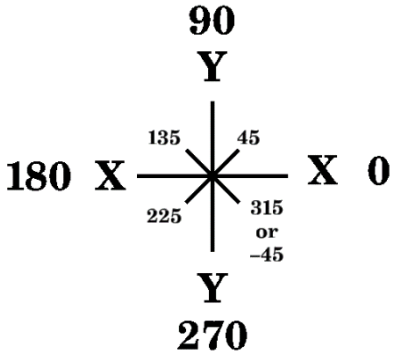
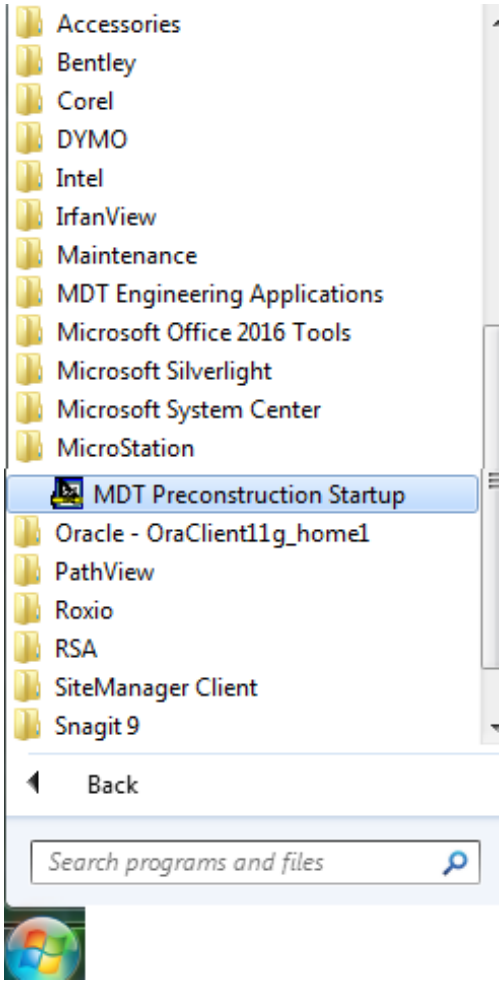


TABLE OF CONTENTS

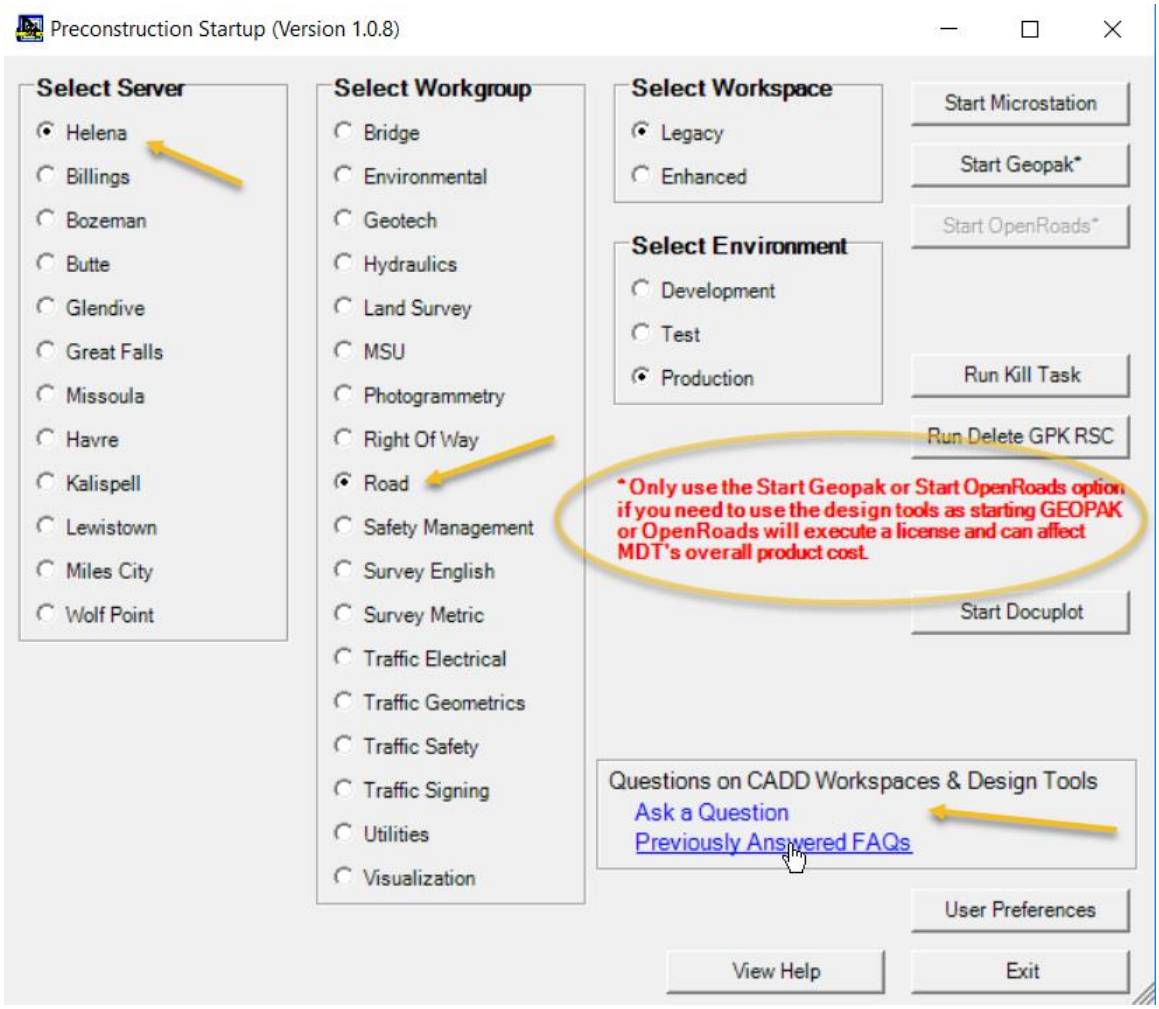
Starting MicroStation

To Open MicroStation:

1) Open the Start Menu
2) Go to Programs > MicroStation > **MDT Preconstruction Startup**



MDT Preconstruction Startup



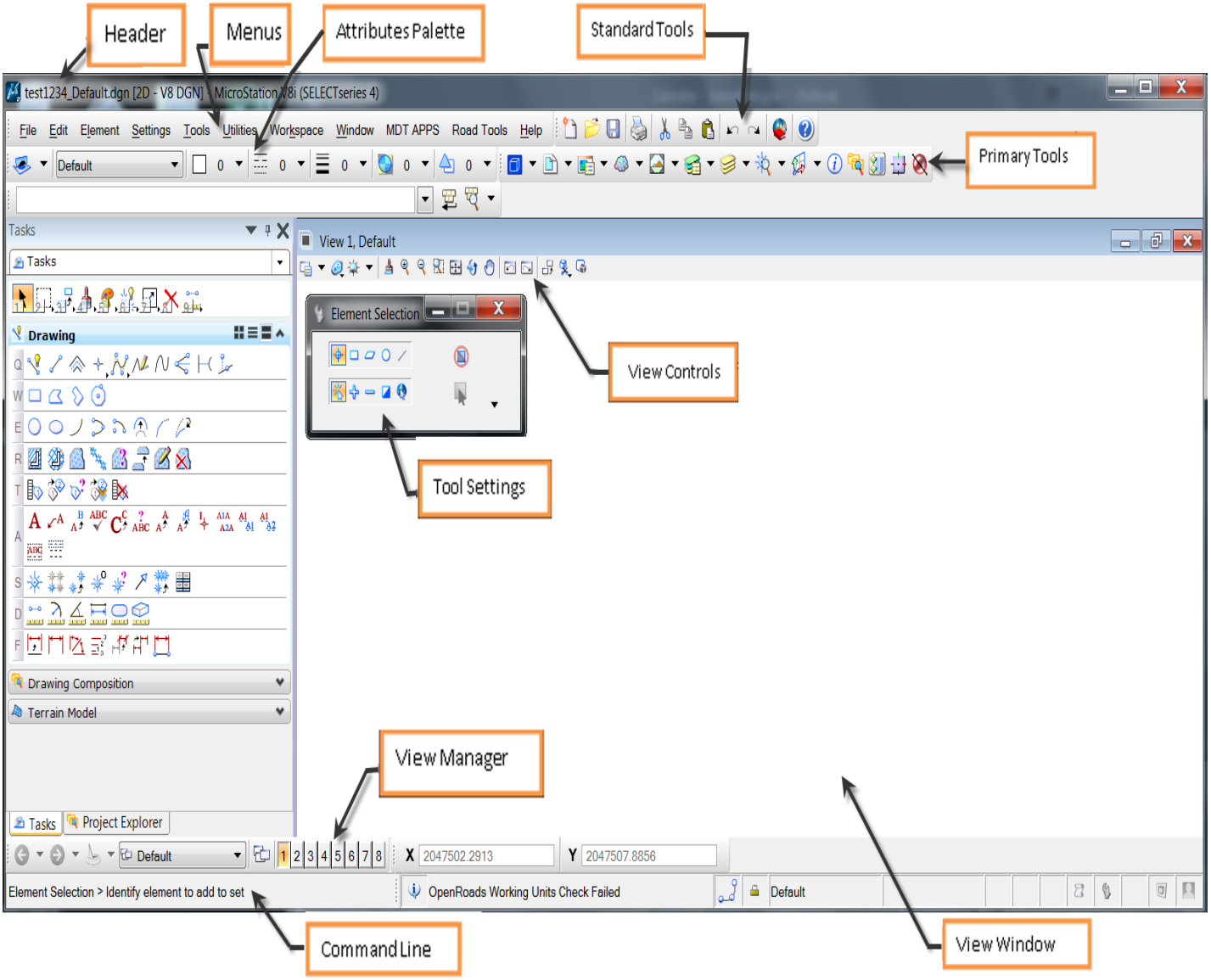
3) Select your **Server** location
4) Select your **Workgroup**
5) Select the **Enhanced** Workspace
6) Select the **Production** Environment
7) Click **Start MicroStation**

Note: The **Legacy** Workspace should only be used for existing projects using GEOPAK Criteria

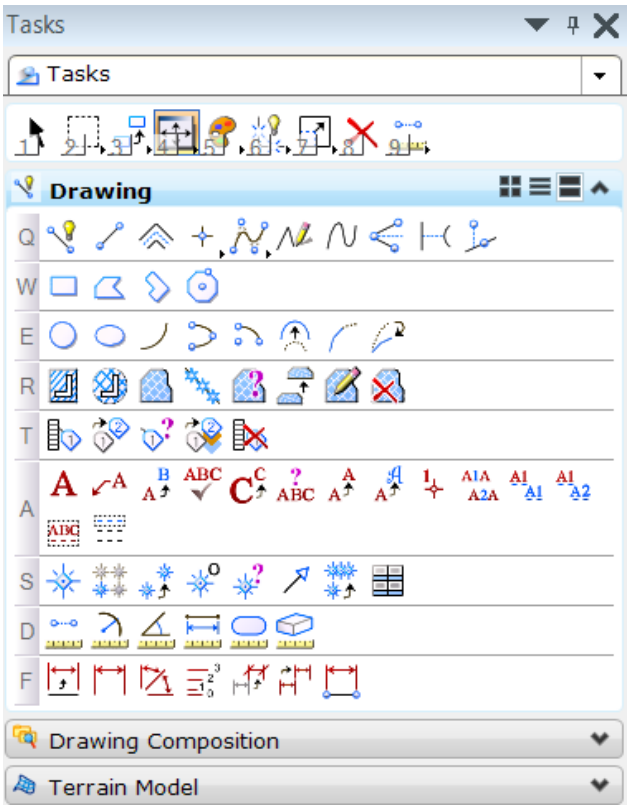
MicroStation Menus and Views

Navigating MicroStation's Default Layout

Below is the default layout of the MicroStation window. This section will familiarize you with the layout and some of the various tools found within MicroStation.



The Task Bar



DGN File Icon appearance

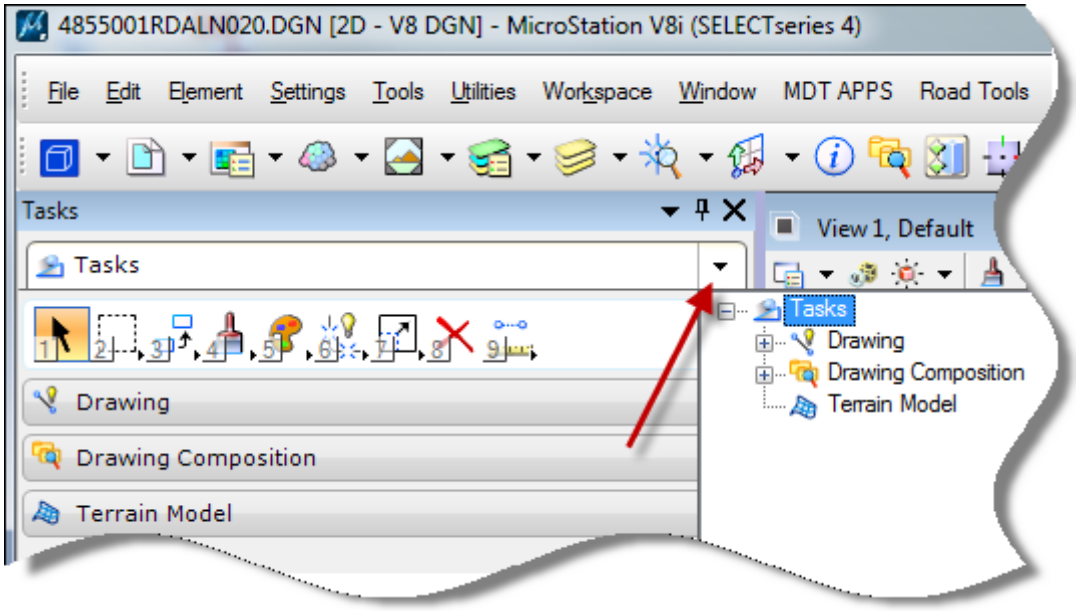
Task Bar

The Task Bar will load on the left side of the screen as shown below. There are 3 sub-menus at the next level: **Drawing**, **Drawing Composition**, and **Terrain Model**.

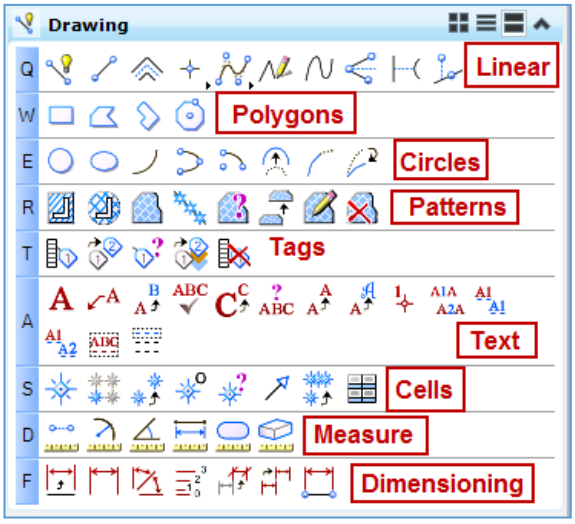
- Drawing includes regular MicroStation commands like Main Classic.
- Drawing Composition includes several Drawing commands and other commands.

To choose the specific task just click on the arrow and then double click on the menu you want to load, and it will load as shown below.

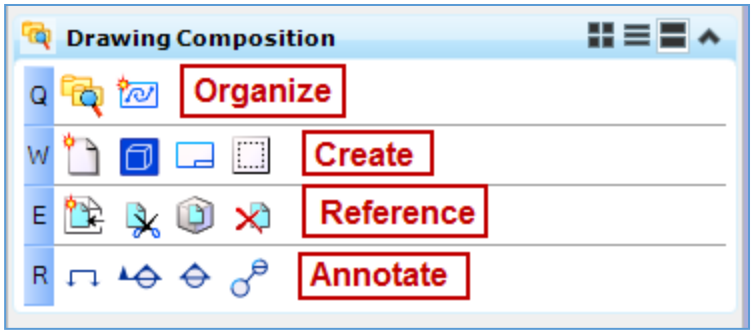
We will default to using the "**Drawing**" task bar for Introduction classroom usage.



- **Drawing** includes normal MicroStation commands, similar to the old Main Classic Toolbar.



- **Drawing Composition** includes several Drawing commands and other commands.

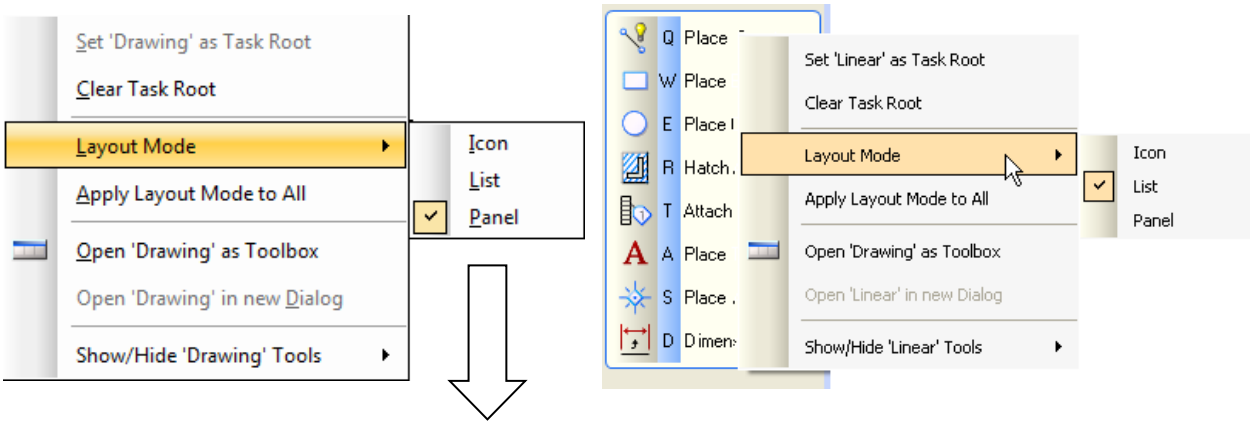


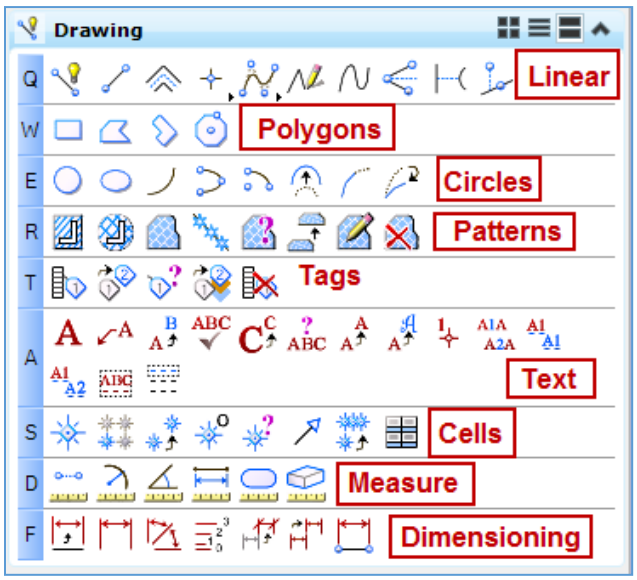
- We won't cover **Terrains** in this class.

To choose the specific task just click on the arrow and then click on the menu you want, and it will load below.

We will default to using the "**Drawing**" Task Bar for Introduction classroom usage.

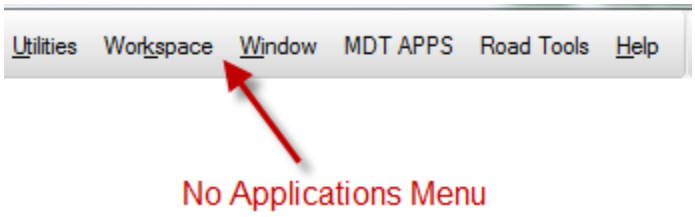
Right click the Drawing bar for results below:



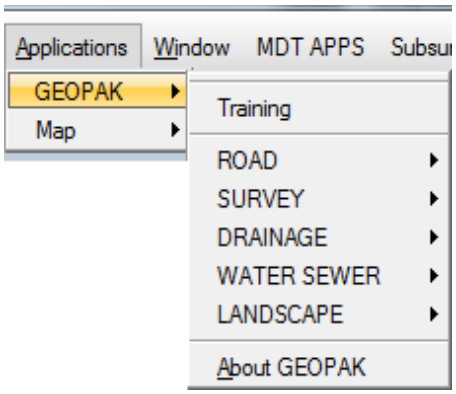


Loading GEOPAK

Geopak is not available when the **Start MicroStation** button is chosen.

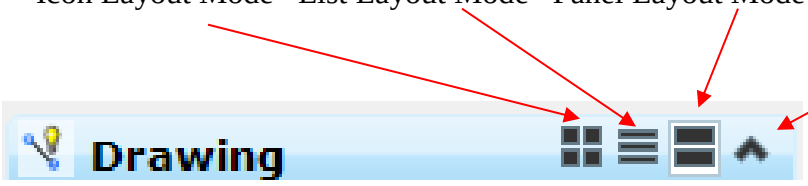


Note: If the **Start OpenRoads** button was chosen, GEOPAK is auto-loaded. We will not utilize GEOPAK in this Class.



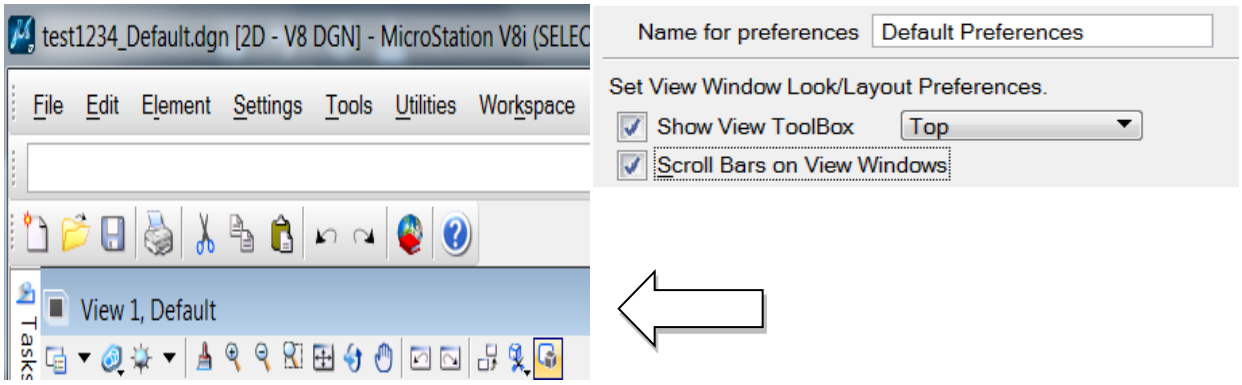
Task Bar Command Views

You can change the way the commands are viewed. Click on the button and you can change it to: You can also right click and get the same options as show below.
Icon Layout Mode List Layout Mode Panel Layout Mode Collapse the Group.



View Control Menu

The View Menu location defaults at the top left of the screen and not bottom left. The location can be changed under the pull-down menu **Workspace** – **Preferences** – **View Options** – **Show View Toolbox**. Options are **Top, Bottom**, **Left**, & **Right** or turn it **off** completely.

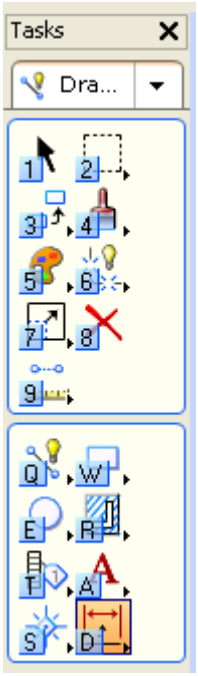


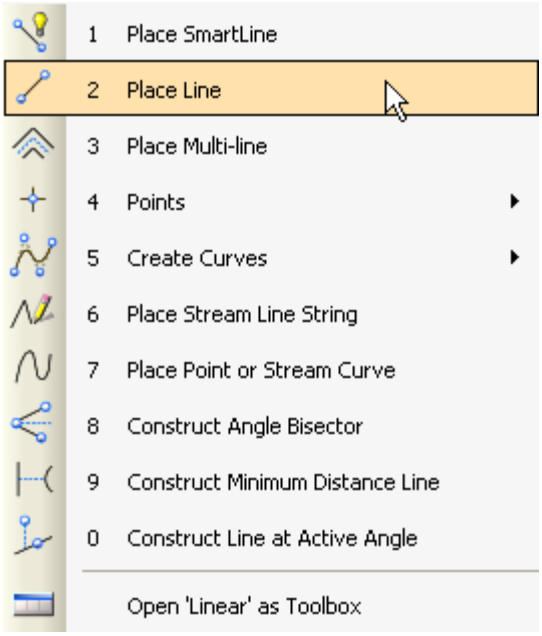
Keyboard Commands

Note the numbers on the top menu and the letters on the bottom menu. If you enter the number or letter it will open the succeeding menu and then you can enter command number or pick it with the mouse.

Note: First highlight, one of three choices in the bar.

Icon\List\Panel:

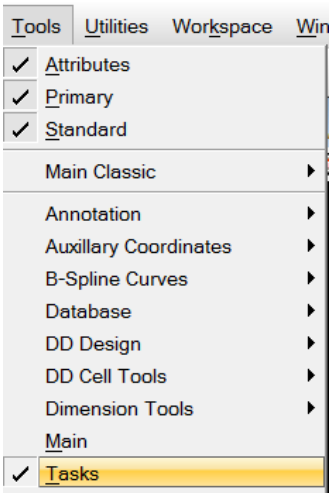




Reloading the Task Dialog Menu

If you close the Task Dialog box you can reload it by doing the following.

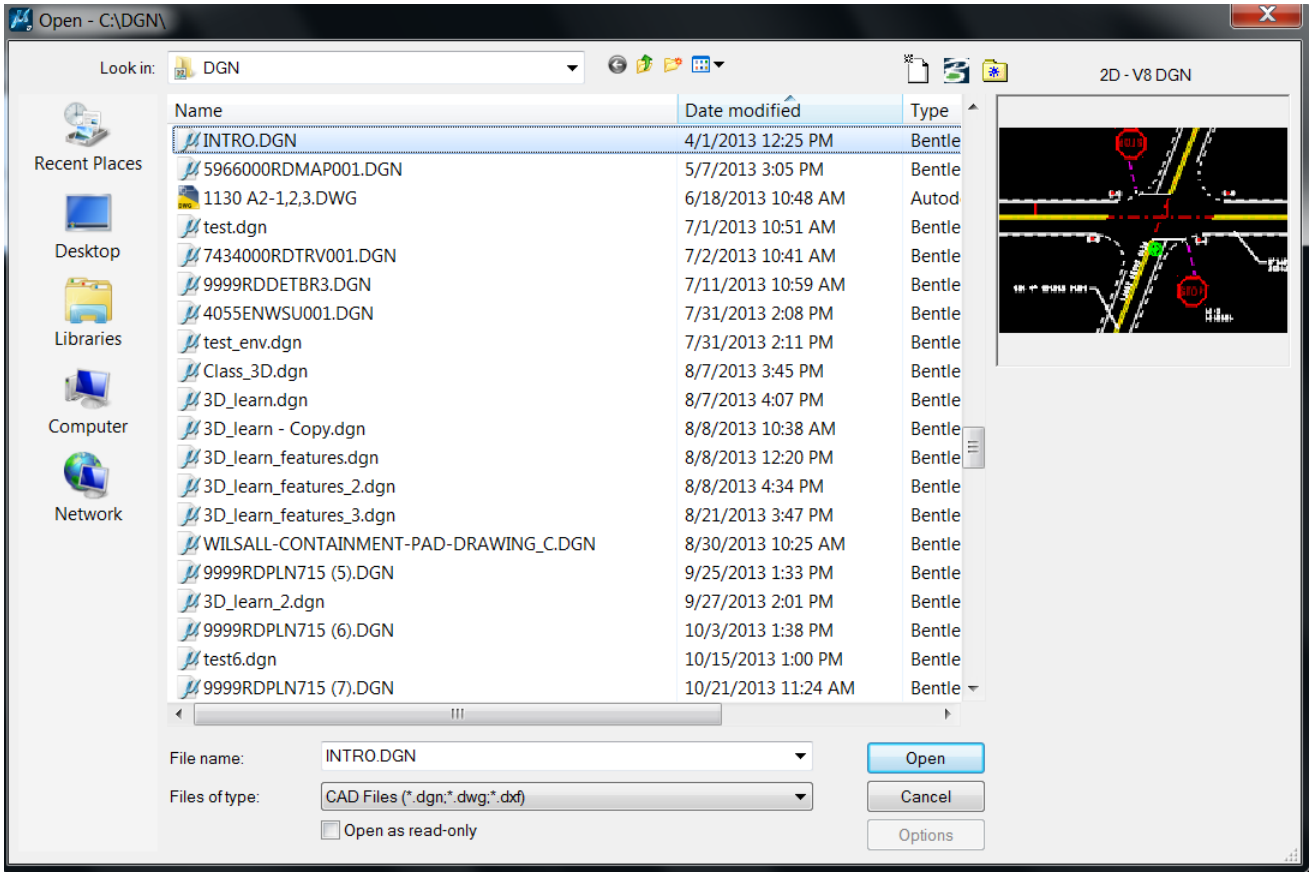
1. Choose **Tools** > **Tasks**



Opening a Design File

While in the “MircoStation Manager” window, navigate to the C:\dgn directory and open the intro.dgn file:

1. Navigate the c:\dgn\intro directory and select “intro class” directory.
2. From “Files:” highlight the appropriate file, **INTRO.DGN**. (**This file will be used in other exercises**.)
3. Click Open.



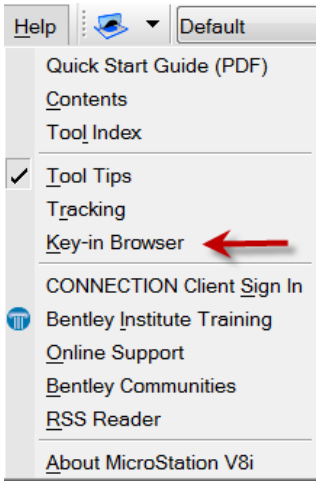
Using Key-in Commands

For those users who are more familiar with AutoCAD or those who prefer keying in commands, MicroStation has the option of using **Key-in** commands instead of the mouse.[1] (**Key-in**s should not be confused with the MDT custom menu MDT **Key-in**s).

If you would prefer to use **Key-in** commands:

1. In the menu bar, go to **Help → Key-in Browser**
2. In the **Key-in** browser, type your command into the **Key-in** area.[2]
3. Hit enter or click the Run **Key-in** Button.

For those who prefer **Key-in**s, **Key-in** commands will be included in future instructions. If you want to keep this menu visible but smaller, it can be docked like any other menu.



[1] The **Key-in** browser includes an auto finish function. To complete the word, simply hit space bar.
[2] If you have worked with the mouse buttons, prefer them, and/or find **Key-in** commands cumbersome or confusing then just ignore this section and future mentions of **Key-in**s.

Setting up the Mouse

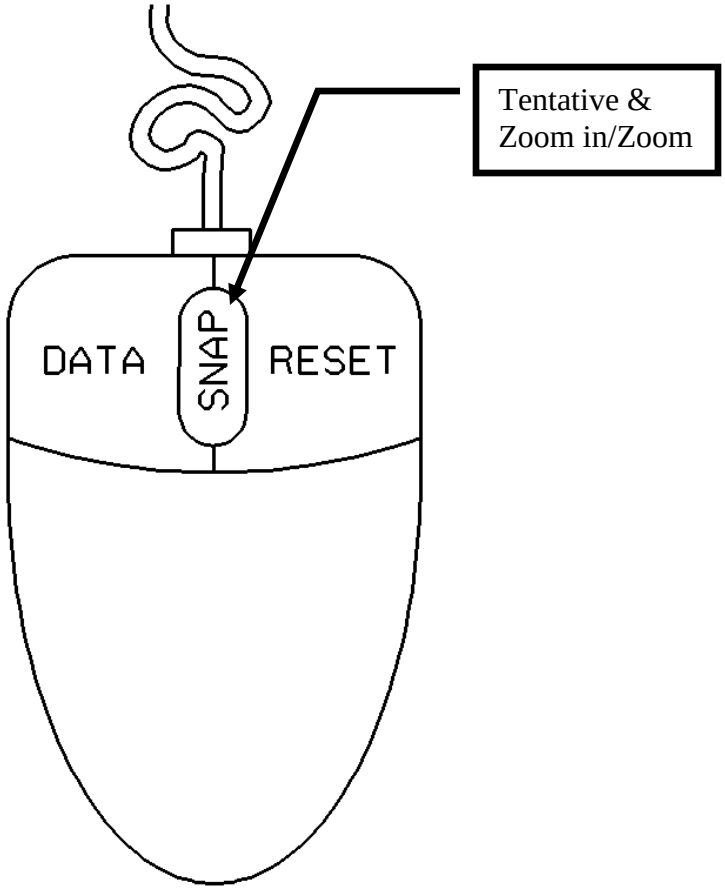
MicroStation comes set up to accept input from a two-button mouse. Standard MDT computers are supplied with three-button mice with scroll wheels. Therefore, you may want to adjust the mouse commands for faster input.
MicroStation calls its graphic input commands buttons. The three MicroStation buttons that are needed for standard use of MicroStation are the Data, Tentative, and Reset buttons.

Data Button: Execute commands, designate the view in which the commands are entered, and accept the commands
Tentative Button: Executes a tentative or snap to a data point.
Reset Button: A reset operation completes an action, cancels an action, or rejects an identified element.

The MicroStation default mouse settings are:
Data = Left Mouse Button.
Tentative = Left and Right Mouse Buttons Together.
Reset = Right Mouse Button.

> WORKSPACE
> Button Assignments

Next page

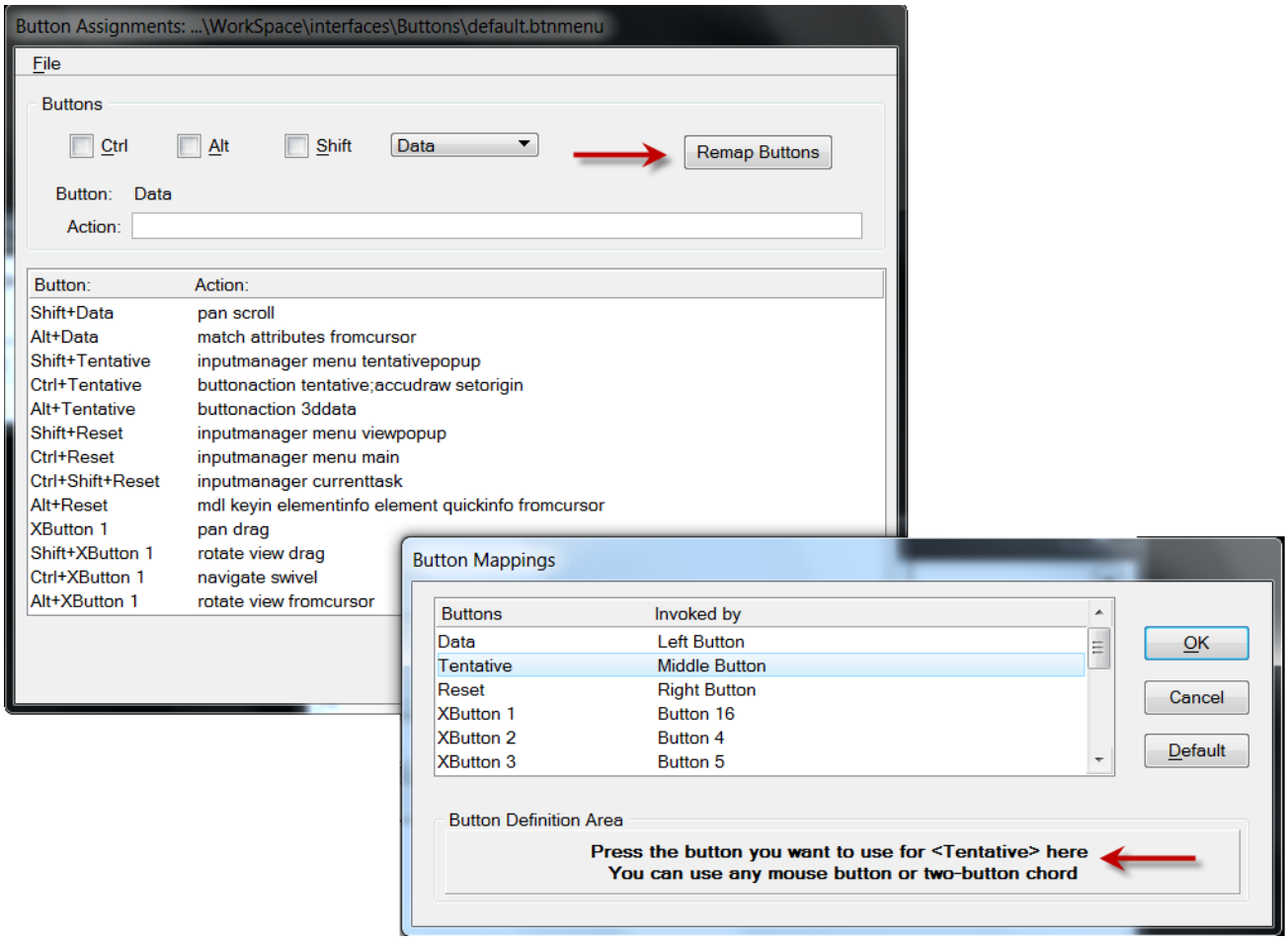


To adjust the commands of your mouse buttons:

1. Go to ***Workspace*** menu.
2. Click on ***Button Assignments***.
3. Click on the Remap Buttons option.

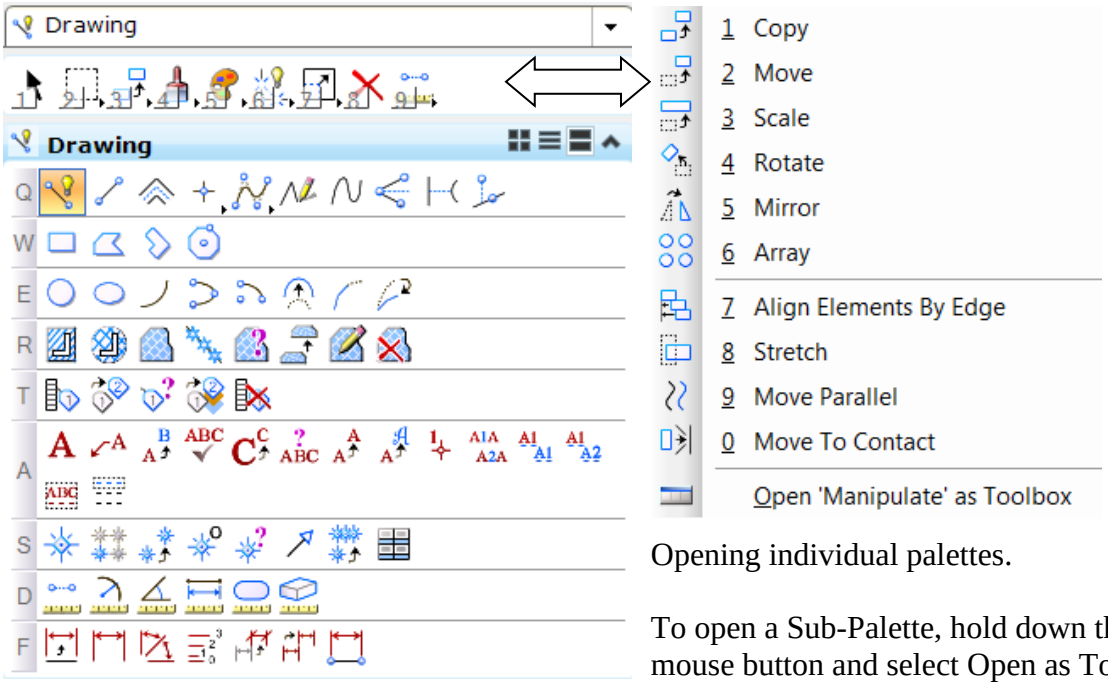
This will show you how each button is currently set. The standard MDT setup is shown below. To change the button assignment:

1. Highlight the button to be changed in the dialog box.
2. Click the button you want to assign to the command in the *Button Definition Area*.
3. Click on *OK* when done.



Key-in: ***DIALOG BUTTONMAP***

Palette Manipulation the Task Bar

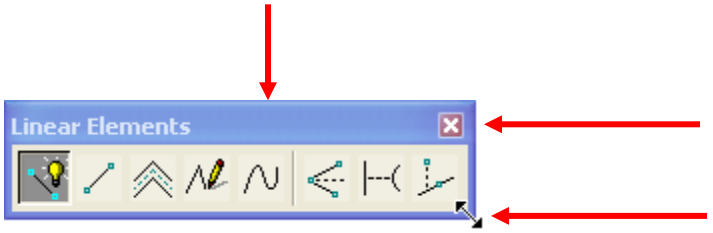


Opening individual palettes.

To open a Sub-Palette, hold down the left mouse button and select Open as Toolbox or select the menu number. Once it is open you may place it anywhere in the work area or dock it along the borders.

Opening these palettes will be very useful when you are first using MicroStation, as it will allow you to easily see and access all the tools in a Sub-palette. It will also be useful later as it will allow you to separate the Sub-Palettes you use most often.

Click (data and hold) on the blue area to move palette around or to dock the palette.



X is used to close the palette.

Used to manipulate the palette size or rotation of palette.

If you have docked the palette and want to undock it you need to place your curser on the line, hold your data button down, and drag it back out into the view window.

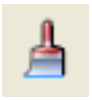
CHAPTER 1

View Controls

The View Controls, along with the Scroll Bars, enable you to adjust what you see in each view and navigate the design file. The View Control Palette is located at the bottom left corner of each View Window. This same menu with more options can be enlarged and placed in the view window or docked. It is located in the menu under Tools, View Control. Below are the main options. There are many more choices under List when you right click on the menu.

Update View	Zoom In	Zoom Out	Window Area	Fit View	Rotate View	Pan View	View Previous	View Next	Copy View

Demonstrate: To utilize Scroll bar option: ***Workspace*** > ***Preferences*** > ***View options*** > ***Scroll Bars on View***



\Update View: Updates or redraws the contents of a view window. Each time an element is created, deleted, moved, or modified it can affect the appearance of the other elements. This tool updates, or redraws, the contents of the active window.

To update a view:

1. Click (data) the Update View button in the view you want to update.

If you have more than one view open, this tool includes a Tool Settings Window that allows you to update all view windows simultaneously.

To update all views:

1) Click the Update View button.
2) When the Update View Tool Settings Window opens, click Update All Views.

Update all Views.

Note: One must have more than **1** view open to update all

Key-in: UPDATE VIEW EXTENDED <view_window_number>

Zoom In: Increases a view window's magnification by a specified ratio, making elements appear larger with increasing detail.

To zoom in using the view control menu:

1. Click the Zoom In button.
2. Move your pointer into the view.
   A dynamically displayed rectangle indicates what the view's new boundaries will be.
3. Click where you want the center of the new view to be.
4. Repeat if needed.
5. When finished click the reset button or select a different tool.

When you have selected Zoom In, this tool includes a Tool Settings Window that allows you to set the Zoom Ratio. The default is set at 2.00.

You can also roll the scrolling wheel forward to Zoom In. It will zoom in where the curser is located.

Key-in: ZOOM IN EXTENDED

Zoom Out: Decreases a view window's magnification by a specific ratio, making elements appear smaller with decreasing detail.

To zoom out using the view control menu:

1. Click the Zoom Out button. The view will zoom out once.
2. Repeat if needed. With repeated zoom outs, you can choose the new center of the zoom out by placing the cursor at the desired center and clicking.
3. When finished click the reset button or select a different tool.

When you have selected Zoom Out, this tool includes a Tool Settings Window that allows you to set the Zoom Ratio.

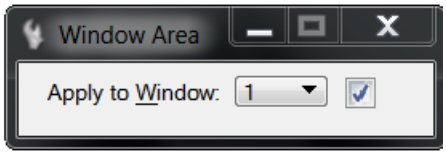
You can also roll the scrolling wheel backward to Zoom Out.

Key-in: ZOOM OUT EXTENDED [zoom_ratio]

Window Area: Indicates a rectangular area in the design that is to be displayed in a view. This is usually done to zoom in.

To Window an area:

1. Click the Window Area button. A full screen crosshair appears to assist in positioning the origin of the area.
2. Click on the view to indicate one corner/edge of the view's new boundaries. A rectangle is started, indicating the view's new variable boundaries.
3. Drag the rectangle to the desired size.
4. Click again to except the view.



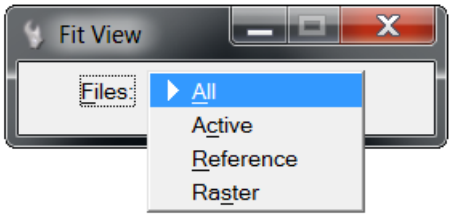
When you have selected Window Area, this tool includes a Tool Settings Window that will appear. It allows you to choose which view to apply the Window Area too.

Key-in: WINDOW AREA EXTENDED

Fit View: Adjusts the view magnification so that the entire design is visible in the view.

To fit a design area into a View:

Click the Fit View button.
The design in its entirety will fit itself into the active View Window.



When you have selected Fit View, this tool includes a Tool Settings Window that allows you to set the scope of the fit operation. You can choose to display Active, Reference, or Raster elements or all three by choosing the All setting.

Setting	Effect
All	Displays all elements in the active design file and any attached references.
Active	Displays all elements in the active design file.
Reference	Displays all elements in attached references, if any.
Raster	Displays all elements in attached raster references, if any.

Key-in: FIT VIEW EXTENDED

Rotate View: Rotates the view in the active View Window.

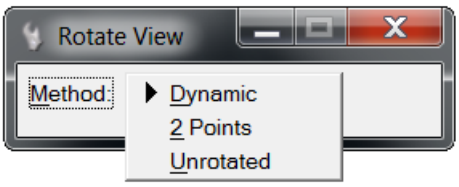
Rotates view but coordinates system does not alter.

To rotate a 2D file view:

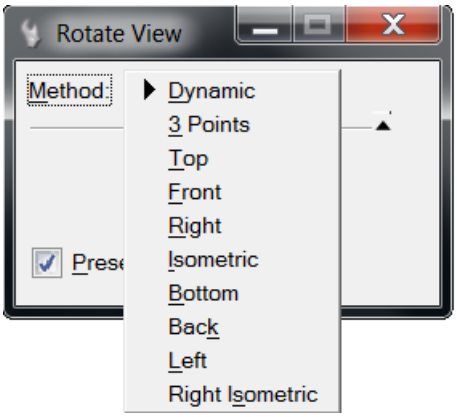
1. Click the Rotate View button. A Tool Settings menu will appear.
2. Select "2 Points" from the drop-down menu next to Method. Click on the point in the design that you want to be the axis the view revolves around. A dynamically displayed rectangle will appear that delineates the outline of the rotated view.
3. Use your cursor to control the rotation and click a second time to complete the rotation.

To un-rotate a view:

1. Click the Rotate View button. A Tool Settings menu will appear.
2. Select "Un-rotated" from the drop-down menu next to Method.
3. Click on the view to be un-rotated. The view will return to its original, un-rotated orientation.[3]



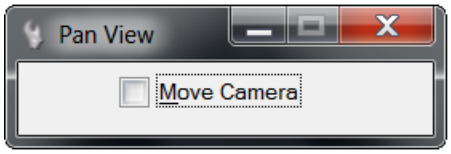
In a 3D file, you will have more rotation choices. This is not covered in the Introduction to MicroStation class.



Key-in: ROTATE VIEW EXTENDED

[3] Hint: The farther away your second point is from your axis point, the easier it will be to control the rotation. The positive x-axis is straight to your right. No rotation will occur if your second point is on the positive x-axis. Be very careful when designing that you always place lines, etc. when the setting is un-rotated. The angle of lines will always be based on the angle at which they were originally drawn. Therefore, any lines drawn while in a rotated view will have different angles than lines drawn while in an un-rotated view.

Pan View: Allows the viewer to see a different part of the design without changing the view magnification.



To pan a view.

1. Click the Pan View button. A Tool Settings menu will appear.
2. You may now use your cursor like the hand in Adobe.
3. Click/hold the data button on the mouse and drag the design to the desired new center of view.

Key-in: PAN VIEW

There are two other ways to pan the view of the design file. Hold the shift key down and then click/hold the data button on the mouse. Drag the curser in the file in the direction desired. This will pan the view of the file. The next way to pan is to use the scroll bars on the right side and bottom of the screen to move the view. This is similar to Word and Excel programs. You can also use the mouse wheel by holding down the ALT key for left and right roaming. You can also roam up and down if you change ht preferences in Workspace – Preference – Mouse Wheel and change the Shift option to Pan Up/Down. It will save these settings for you.

View Previous: Undo a view operation.

To undo a view operation, simply click the View Previous button.

Key-in: VIEW PREVIOUS

View Next: Redo a view operation.

To redo a view operation, simply click the View Next button.

These can be useful if you have zoomed into a small are and then fit view and want to get back to that same small area again.

Key-in: VIEW NEXT

View Toggles

View Toggles allows you to navigate easily through multiple (up to eight) View Windows at once. You can open or close any of the views by simply using the View Toggles. The View Toggles tool window can be found on the bottom left corner of the screen.

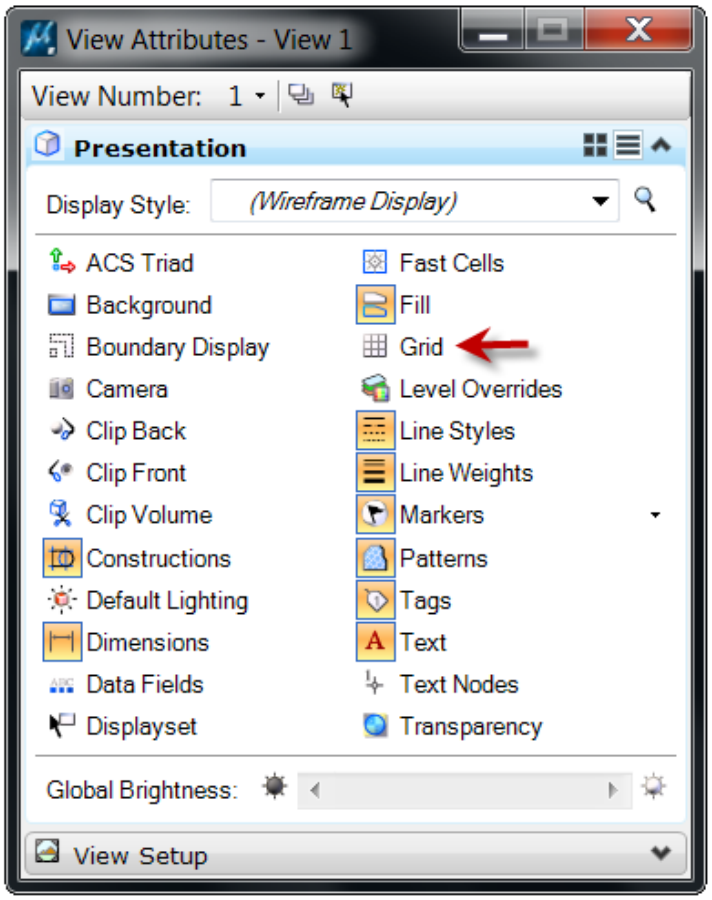
View Toggles: Open or close a View Window

Tip using: ***Windows*** **>** ***Tile*** from the MicroStation menu can give you a head start to arraging mutlitiplue views in a single file.

Grids

Though grids are not used very much at MDT, they provide a good method of understanding the concept of the x- and y-axes that the workstation exists on.

To use the grid:

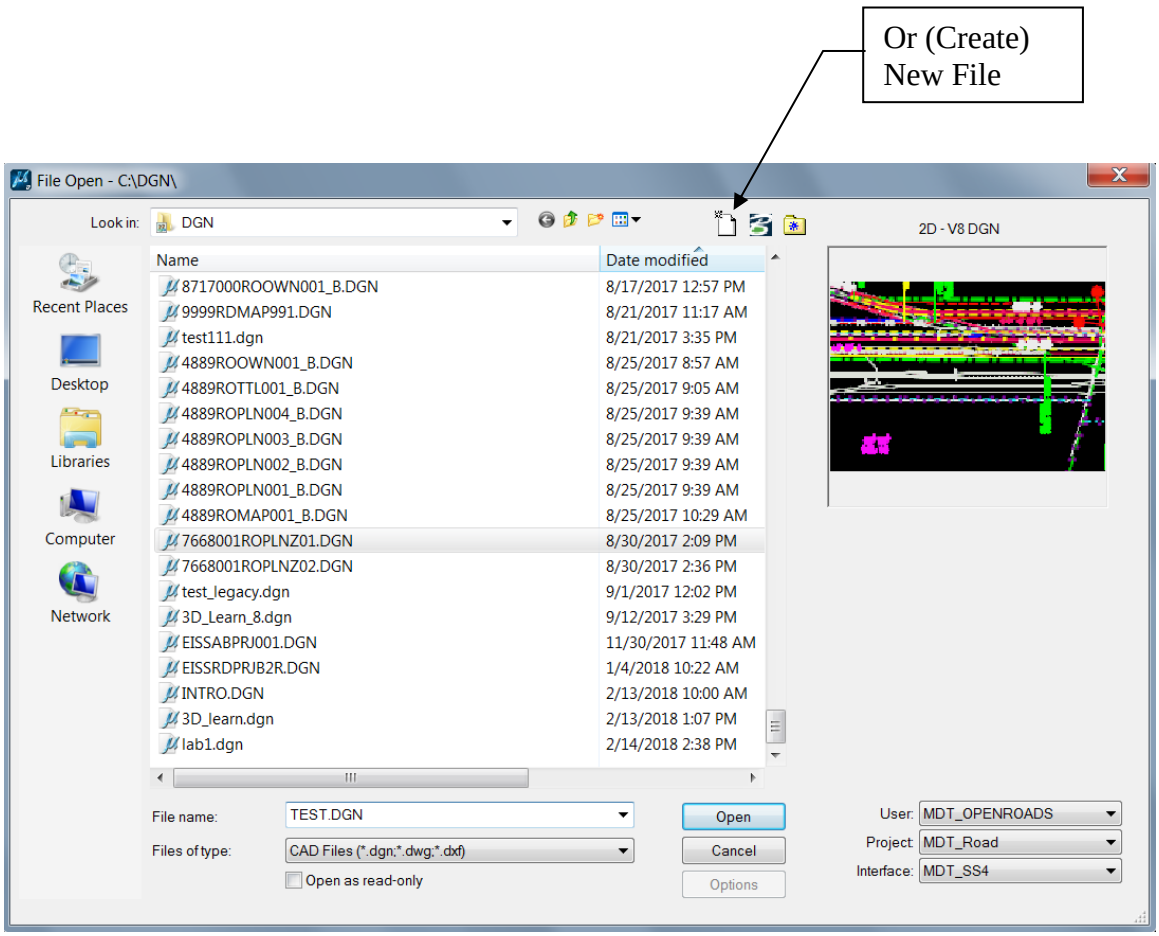


Go to the Settings menu and select "View Attributes" or press "Ctrl B". A Dialog Window will appear. Once the window appears, choose the appropriate view from the drop-down menu; then check the "Grid" box and hit "Apply" at the bottom left of the Dialog window.

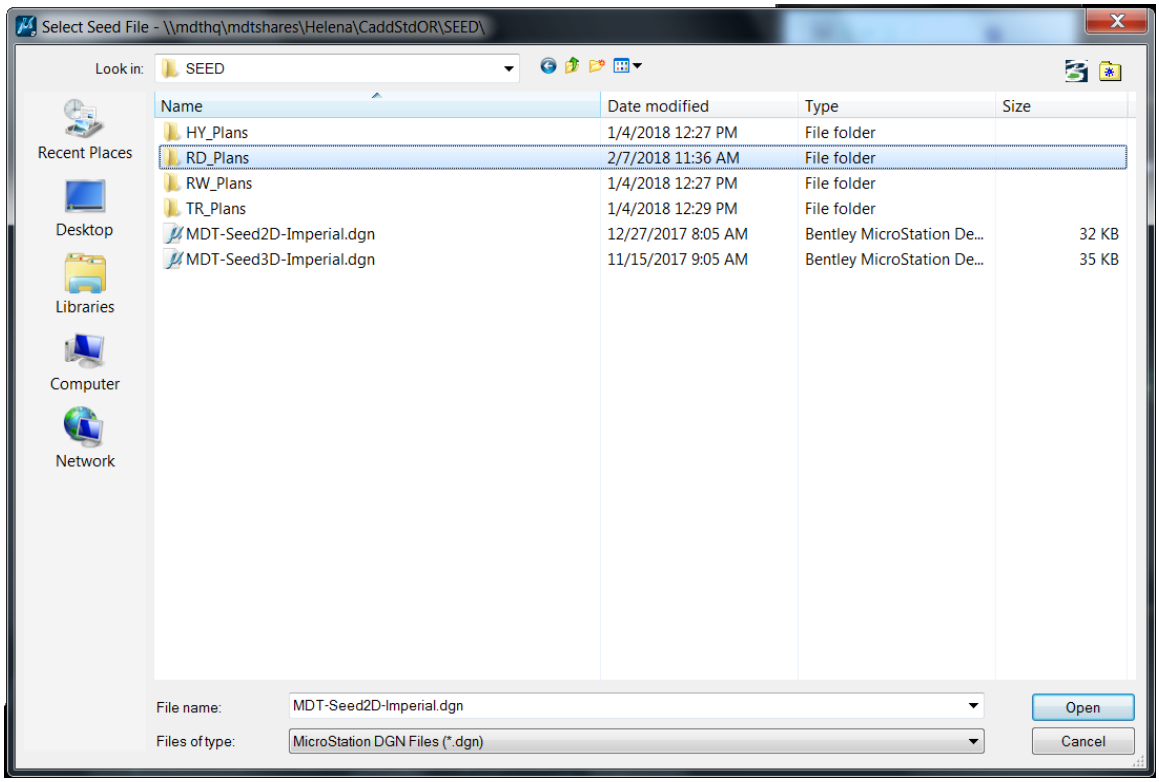
See Grid snap under Locks, zoom to close Grid tightness to see Line snap.

Creating a design file

Creating a design file is similar as creating a new Word Document, Spreadsheet, or e-mail. Simply go up to the File menu and select “New,” or use Ctrl+N. When you select “New” a Dialog Window will appear.



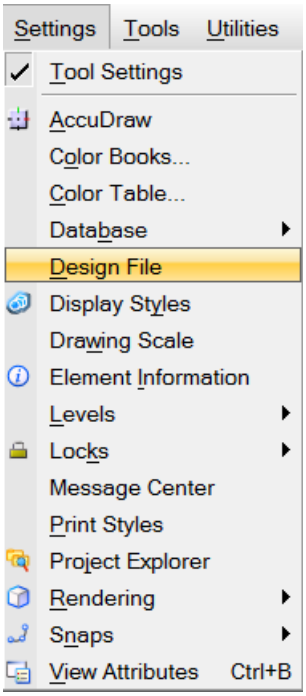
When the Dialog Window appears, name your file, and make sure it is in the appropriate folder. Once you have done that, you will need to select your Seed File; do that by clicking the “Browse” button in the bottom right corner of the Dialog Window. A second Dialog Window will appear.



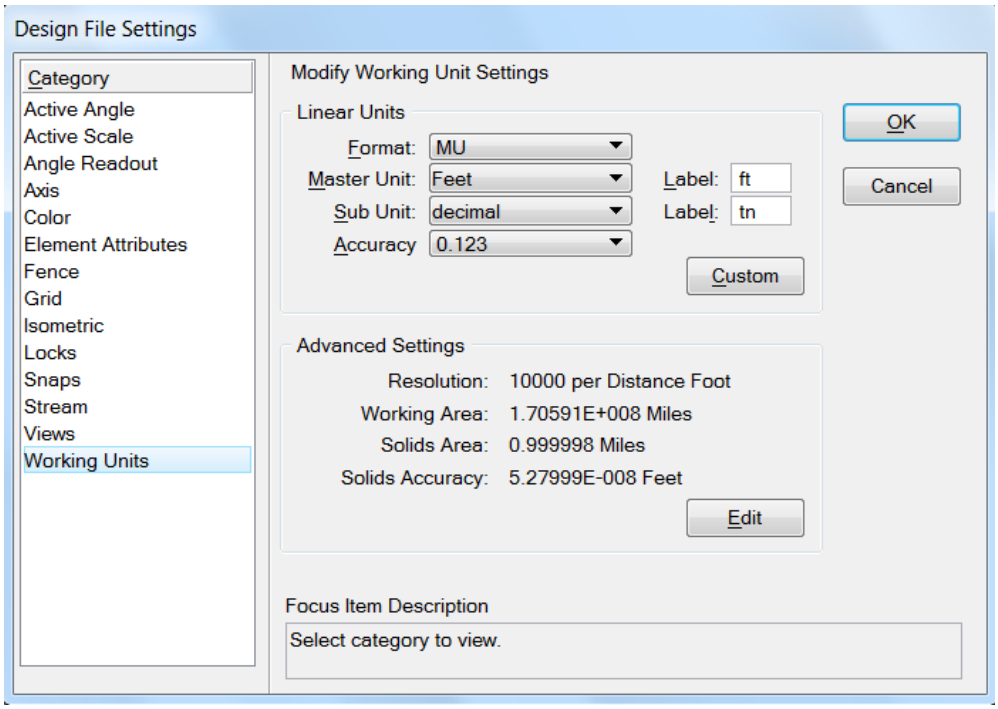
When the Seed File Dialog Window appears click on the Seed File "MDT-Seed2D-Imperial.DGN." This will assure that you are working in the correct measuring units (MDT standard is feet and decimal feet, rather than meters and millimeters). The default directory should \SEED. Click OK and this will open a blank design file.

Working Units

To double check that you are using the correct measuring units, or to change working units go to the Settings Menu and choose “Design File.” A Dialog Window will appear.



When the Dialog Window appears, select “Working Units” at the bottom of the “Category” menu. To assure you are working in the MDT standard, select the second “Feet” option under “Master Unit” (the first is Survey Feet) and “decimal, foot” under “Sub Unit”. The “Label” options should change themselves to “ft” and “tn” = tenth respectively.[4]



LEGACY: 1000
EHANCED: 10000

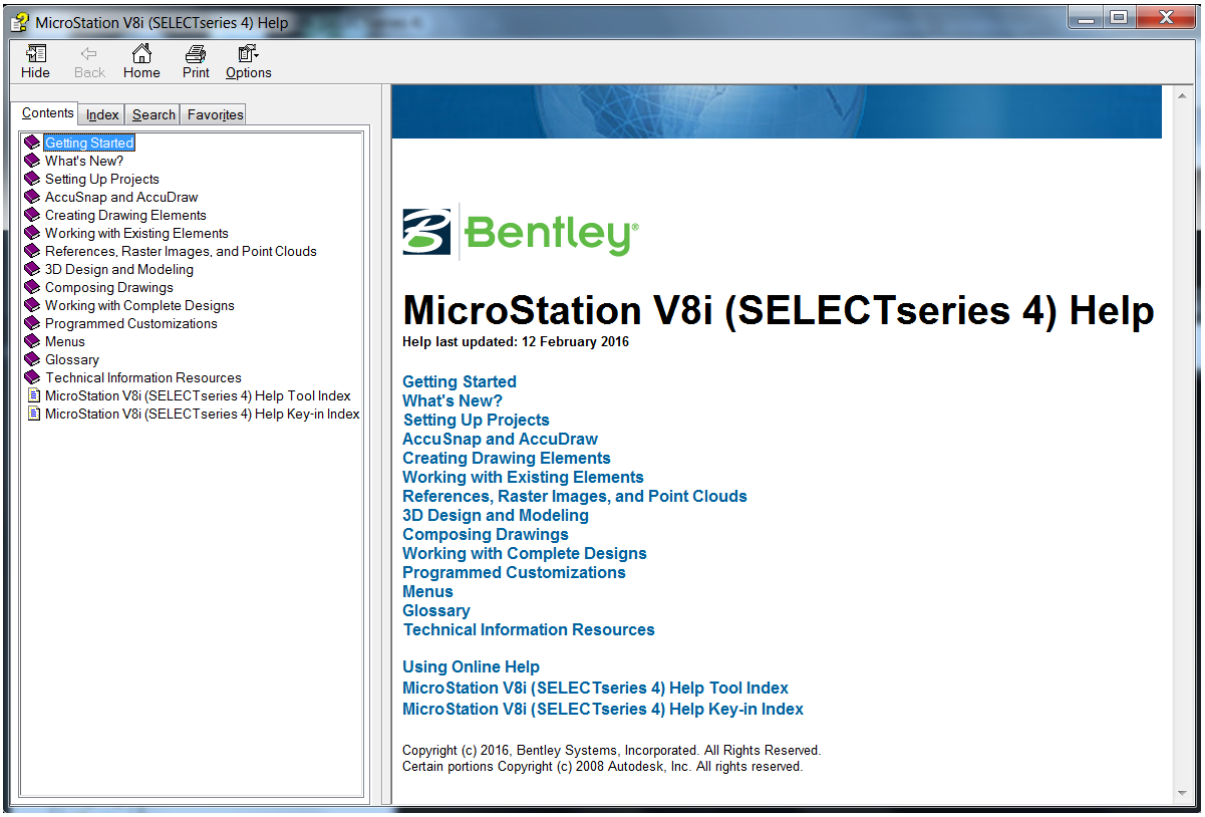
[4] It is recommended that the MDT CADD Standard Seed files be used for MDT projects. Modifications to the working units can create significant problems with design work.

Help

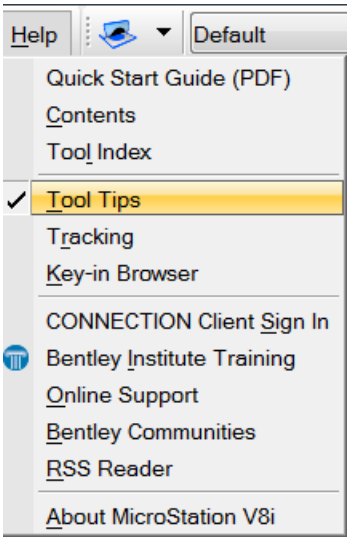
MicroStation has one of the most complete, detailed and comprehensive Help files of any computer program on the market – designing or otherwise. While this is impressive and very useful, the massive amount of information contained in the Help file can be rather daunting. However, you should keep in mind that the help file is designed to be user friendly and can be easily navigated.

Firstly, if you go to the Help menu and select "Contents," the Help Dialog Window will open. The Help Dialog Window is fairly versatile – letting you select what you want from a list or use the search function if you don't know where to find your answers. In addition, the entirety of MicroStation is indexed – so you can search that way as well. If you find yourself looking up particular subjects often, you can even add them to a "Favorites" list, so you don't have to do a search every time.

"F1" or HELP menu pulldown



To use Tool Tips



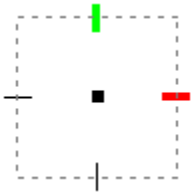
Go to the Help menu and click on "Tool Tips." A check mark will appear next to the option. Once "Tool Tips" is turned on, pale yellow informational bubbles will appear when you hover your mouse over a tool, view control, view group, or even design element.

To use Tracking:

Go to the Help menu and select "Tracking." Just as with "Tool Tips," a check mark will appear next to the option. When "Tracking" is on, every time you select a tool from the *View Controls* or *Main Palette* "Tracking" will open the Help Dialog Window to the page on whatever tool you are using.

In addition to the Help Dialog Window, the Help menu has several other quite useful features. One of those is the "Tool Tips"

AccuDraw



One thing you may notice when you begin placing elements is a crosshair around your cursor. AccuDraw can be a very useful tool. You can turn it off by selecting the AccuDraw toggle in the Primary Tool Bar. You can permanently turn AccuDraw off by opening the AccuDraw Settings dialog box under pull down menu Settings - AccuDraw. Check off the option for Auto Load.

List of basic AccuDraw Shortcut Key-ins

The following table lists keyboard shortcut and its effect. Additional information about the effect of individual keyboard shortcuts is presented in the general discussions of AccuDraw procedures.

DO NOT USE ACCUDRAW WITH CIVIL TOOL (YOU MUST TURN IT OFF)

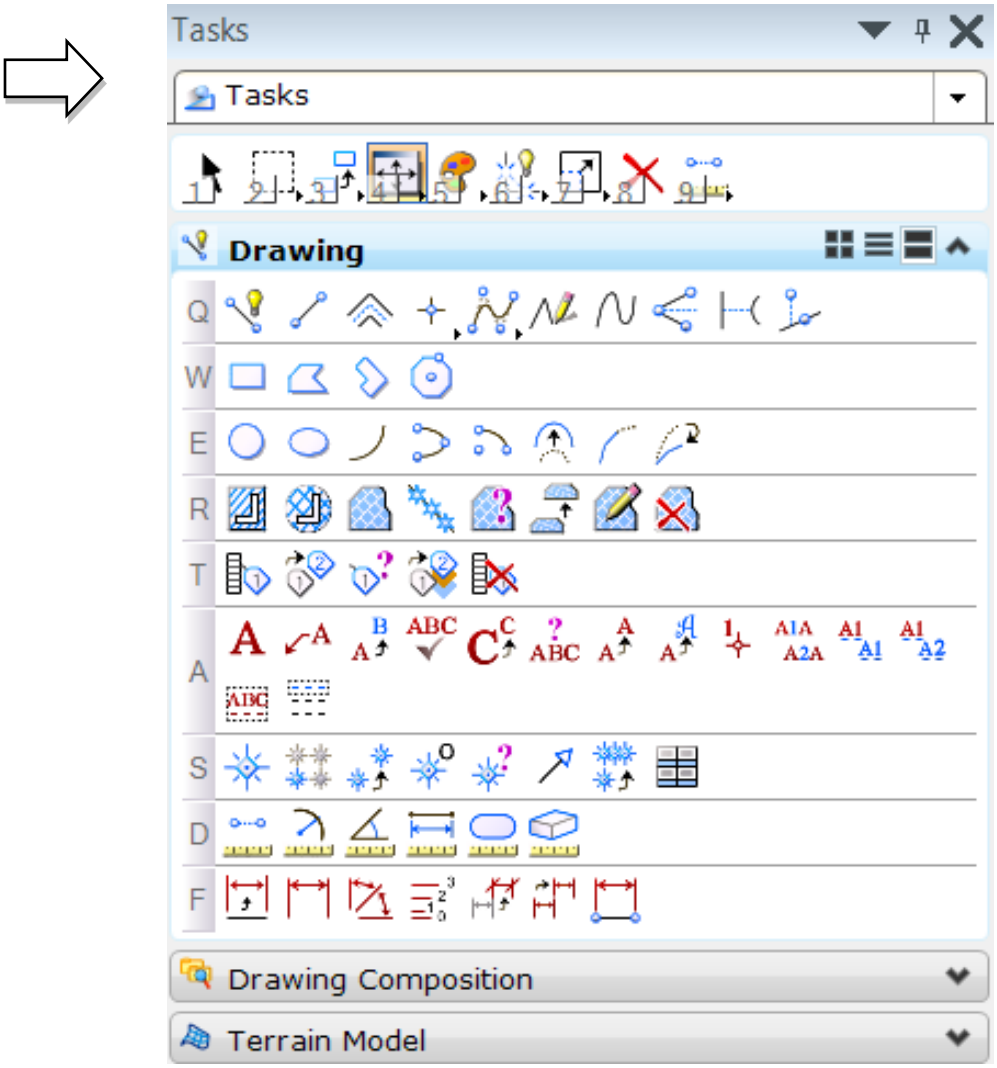
Key	Effect
<Enter>	Smart Lock • In Rectangular coordinates, locks X to 0 if the pointer is on the drawing plane y-axis or Y to 0 if the pointer is on the x-axis. • In Polar coordinates, locks Angle to 0°, 90°, -90°, or 180° if the pointer is on a drawing plane axis or otherwise locks Distance to its last entered value.
<Space bar>	Switches between Rectangular and Polar coordinates.
<V>	Rotates the drawing plane to align with the view axes. Pressing this key a second time restores context-sensitive rotation.
<T>	Rotates the drawing plane to align with the axes in a standard Top view. Pressing this key, a second time restores context-sensitive rotation.
<A>	Switches the lock status for the Angle value.
<Q>	Deactivates AccuDraw.

Keyboard shortcuts are *not* case sensitive.

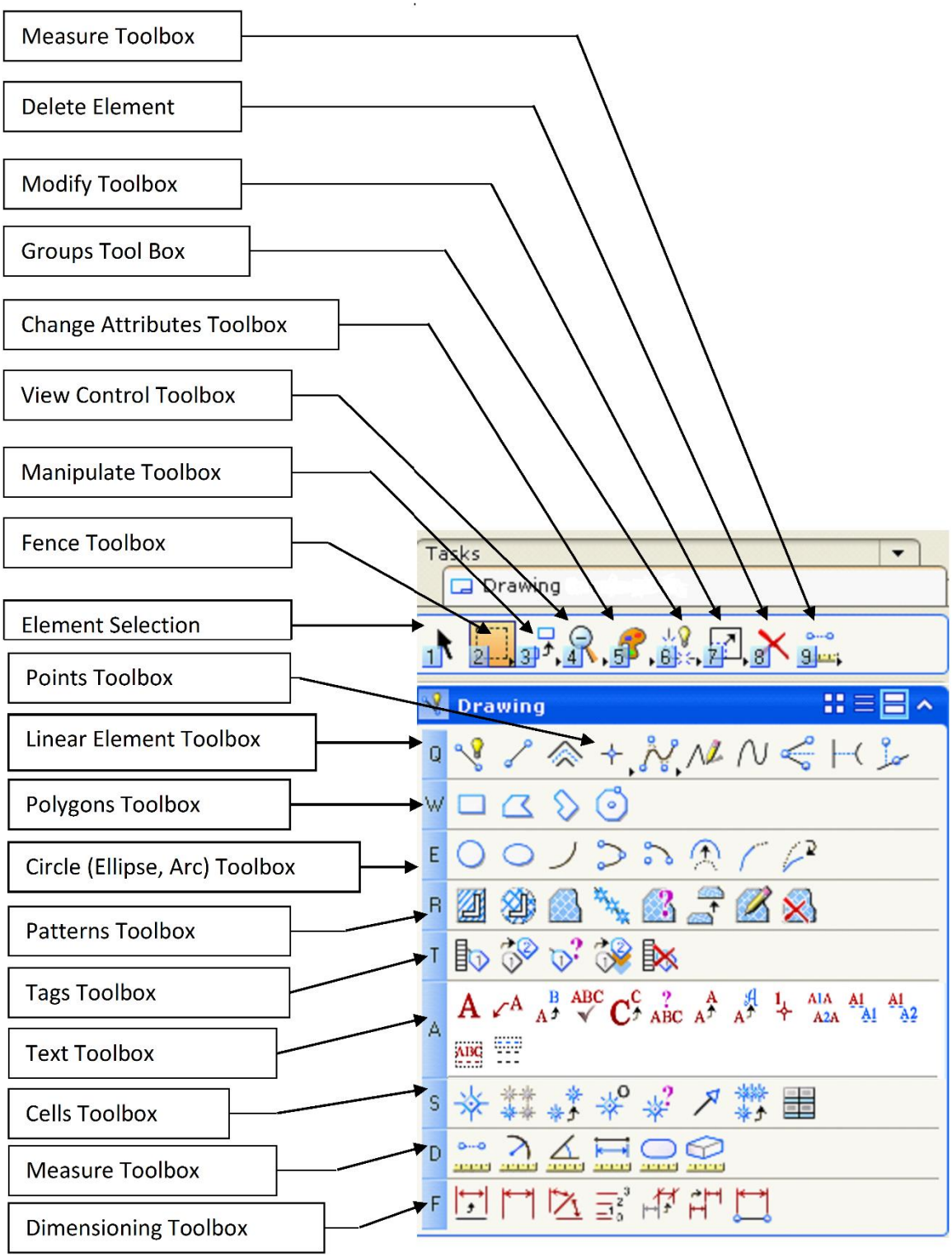
The Task Palette

NEW Task style:

NEXT PAGE

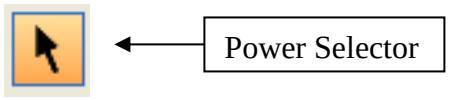


Task method: (Recommended method)



The Element Selection Sub-palette

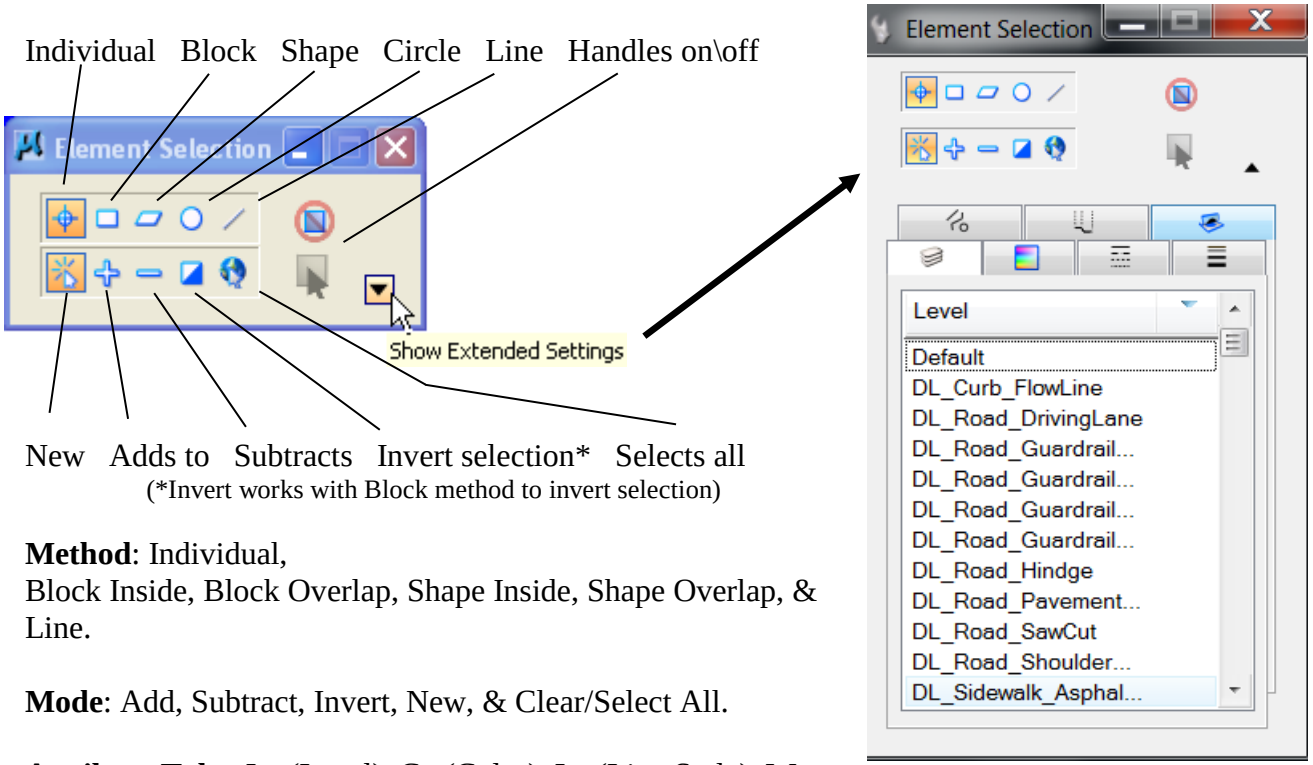
Element Selection is a versatile tool that can mimic many of the actions of other tools, though it may be less exact.



Key-in: CHOOSE ELEMENT

The Element Selector Tool can be use like a fence. It will fence and highlight all of the elements entirely inside the fenced area. It also can be used to highlight individual elements. If the element or elements are highlighted, you can manipulate them like delete or drag and move them.

Tip: Hold down the "**Ctrl**" key to add or remove entities from your selection set.



(*Invert works with Block method to invert selection)

Method: Individual,
Block Inside, Block Overlap, Shape Inside, Shape Overlap, & Line.

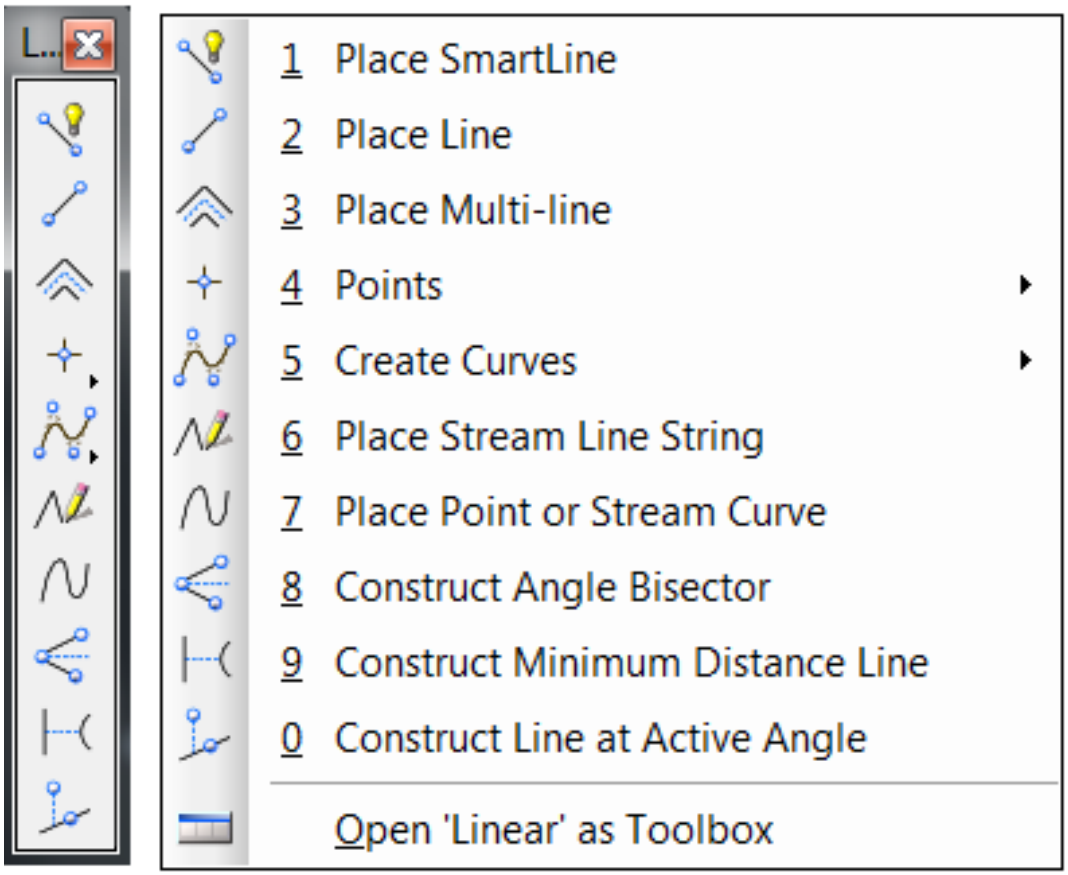
Mode: Add, Subtract, Invert, New, & Clear/Select All.

Attribute Tabs: Lv (Level), Co (Color), Lc (Line Style), Wt (Weight), Ty (Type), & Cl (Class).

In the extended settings for the Element Selection window, tabs let you select elements by one or more attributes — Level, Color, Line Style, Line Weight, Element Type, Element Class, Element Template, Text Style, Dimension Style, Multi-line Style, Transparency, and Display Priority. Alternatively, when you select elements graphically, the active set of attributes displays as a highlighted group in each tab's list box.

Linear Elements Sub-Palette

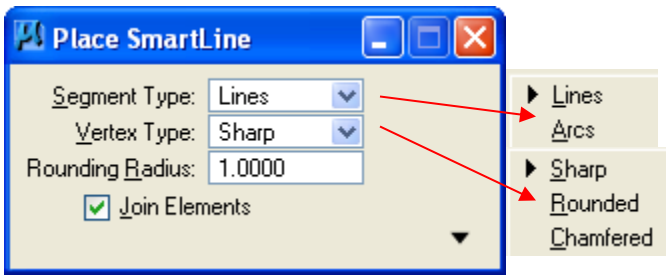
One of the most basic elements you place will be lines. They are also the one of the most used elements.



Place SmartLine

General tool for placing open or closed linear elements.

To place a SmartLine:



1. Select Place SmartLine Tool.
2. Select the Segment Type.
   a. Line - to create line segments.
   b. Arc - to create arc segments.
3. Select the Vertex Type.
   a. Sharp - no rounding or chamfering.

b. Rounded - Rounds vertex by radius specified.
c. Chamfered - Chamfers vertex by offset specified.

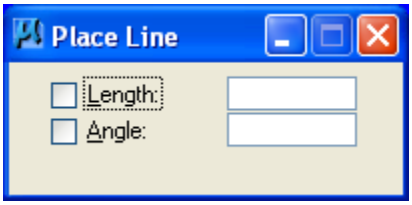
4. Toggle Join Elements on/off.
    a. On - The segments will create a closed chain upon snapping to the first vertex point.
        i. A close cursor will appear when near first point if you require a closed shape, accept to complete if applicable.
        ii. On - Select Area Type, Fill Type and color.
    b. Off - The segments will remain separate elements that may have different symbology.

Key-in: PLACE SMARTLINE

Place Line:

General tool for placing line segments.

To place a Line:

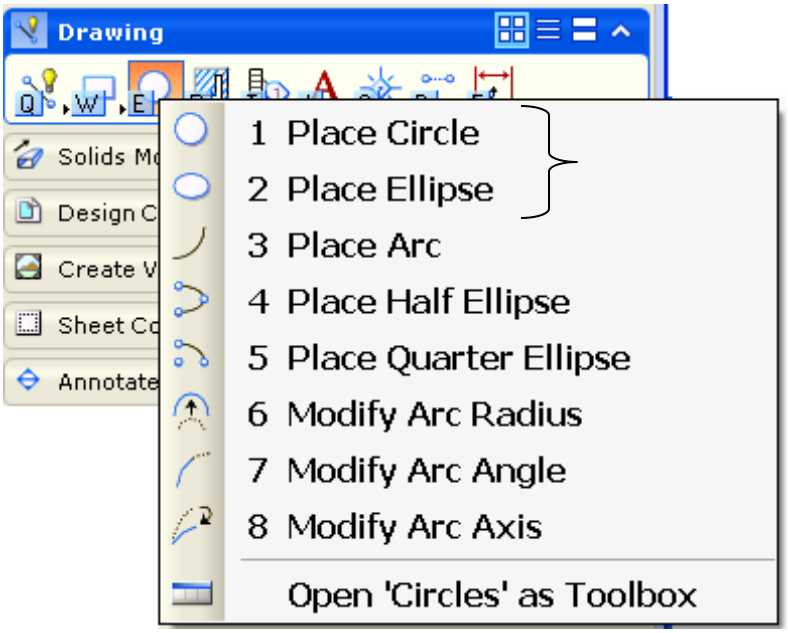


Placing a line is almost exactly the same as placing a SmartLine. The only real difference is that with SmartLine, you can make all of the line segments into a single element and you can create different effects with the Vertex Type. However, when placing a line you can also manually input a particular length and/or angle – this is helpful if you need to place several lines that are the same length and at the same angle, but don't necessarily come into contact with each other.

Key-in: PLACE LINE [CONSTRAINED | ANGLE]

The following will not be covered in the Introduction to MicroStation class:
Place Multi-Line
Place Stream Line String
Place Point or Stream Curve
Construct Angle Bisector
Construct Minimum Distance Line
Construct Line at Active Angle

Ellipse Sub-Palette



Another basic element you will be using is the ellipse.

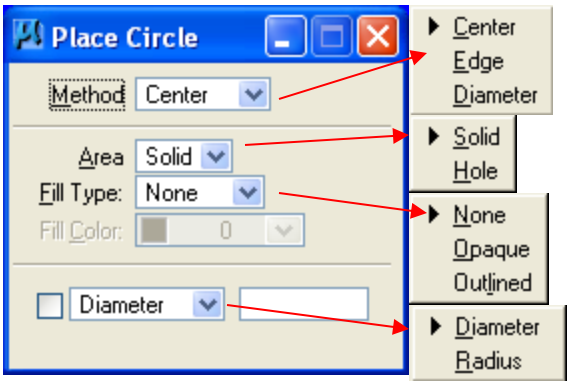
Place Circle

Place a Circle

To Place a Circle:

1. Click the Place Circle button. A Tool Settings window will appear. From here, you have several options: you may draw your circle by establishing the center point and moving outward, by establishing two points along the outside edge of the circle and using a third point to complete your circle, or by establishing one point and using the second point to determine the diameter of the circle.
2. Once you have decided on the Method, you will need to decide on the Area type: either Solid or Hole. After the Area type, you will need to choose between the three different Fill types: None, Opaque and Outlined. [5] Depending on your Fill choice, you may also be able to choose a color.
3. After the Area type, you will need to choose between the three different Fill types: None, Opaque and Outlined. Depending on your Fill choice, you may also be able to choose a color.
4. If you want to make several circles of the same size, you may choose to set the Radius or Diameter to a particular increment.

5. Once you have made all your choices click the Data Button where you want your circle to be in the Workstation, make your circle the desired size, and click the Data Button again to accept the circle.



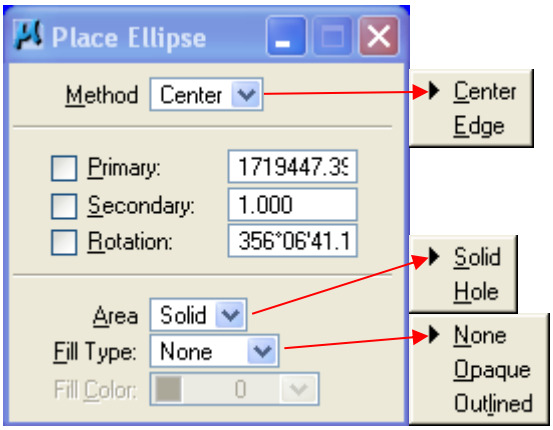
Key-in: PLACE CIRCLE ICON or PLACE CIRCLE < CENTER | EDGE | DIAMETER > [CONSTRAINED]

Place Ellipse

Place an ellipse.

To place an ellipse:

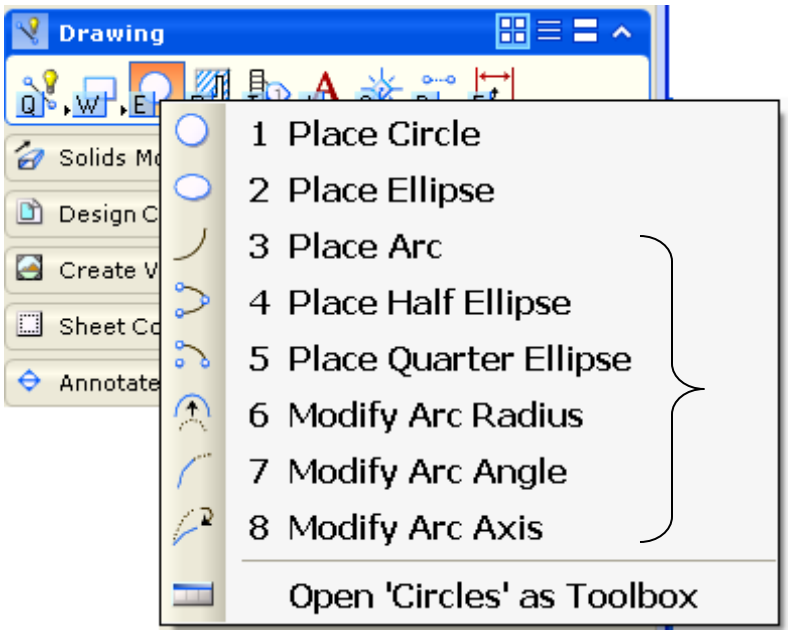
1. Select the Place Ellipse button. A Tool Settings Window will appear. The options for placing an ellipse are nearly identical as those for placing a circle. The only difference is that when making an ellipse there is no “Diameter” setting.
2. If you want to set the size and angle of rotation of the ellipse, you can do so by typing in the length of the Primary and/or Secondary axis radius and the angle of Rotation.
3. Once you have made your choices you can place your ellipse just as you would a circle.



Key-in: PLACE ELLIPSE ICON or PLACE ELLIPSE < CENTER | EDGE > CONSTRAINED

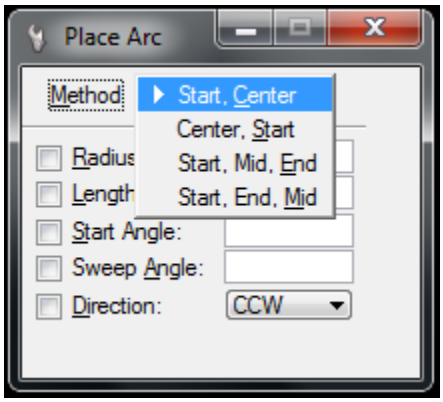
Arcs Sub-Palette

The Arc Sub-Palette will not be so widely used as the Linear Elements Sub-Palette, however it does contain some very useful tools.



Place Arc

Place a circular arc. This will probably be the most useful tool in the Arc Sub-Palette.



To place an arc:

1. Choose your method; your choices are “Start, Center”, “Center, Start”, Start, Mid, End” and “Start, End, Mid”.
2. If you want to make several arcs with the same measurements you can use the “Radius,” “Length,” “Start Angle,” and “Sweep Angle” options to set your measurements. Keep in mind, setting the “Radius” and “Length” means that the “Sweep Angle” will set itself accordingly.

Key-in: PLACE ARC ICON or PLACE ARC < CENTER | EDGE > CONSTRAINED

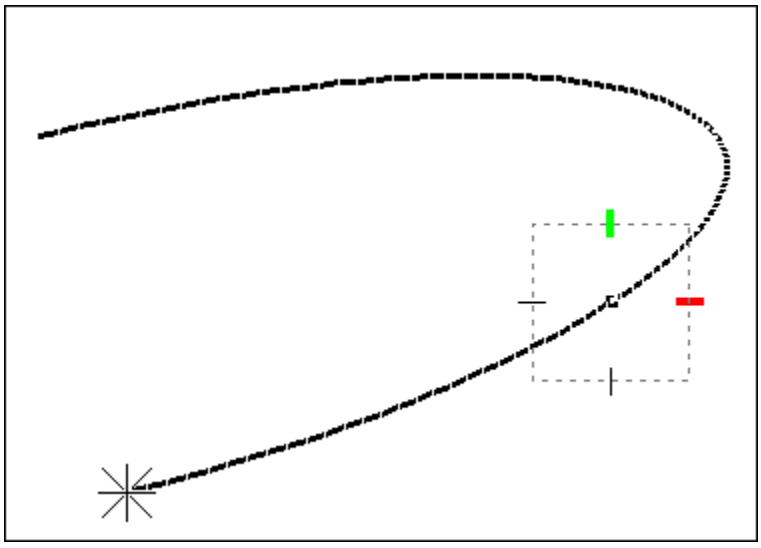
Placing a Partial Ellipse

Neither of the tools for placing partial ellipses is used very often at MDT. Both work on the same principle of using three points to establish the path of the elliptical arc.

Place Half Ellipse
Place an elliptical arc with a sweep of 180 degrees.

Key-in: PLACE ELLIPSE HALF

Place Quarter Ellipse
Place an elliptical arc with a sweep of 90 degrees.



Key-in: PLACE ELLIPSE QUARTER

Arc-specific Modification Tools

Modify Arc Radius

Modify the radius, sweep angle, and center of circular arc.

To modify an arc's radius, sweep angle, and center:

1. Select the Modify Arc Radius button.
2. Select the arc you wish to modify. Adjust the radius, sweep angle, and center as you need.

Key-in: MODIFY ARC RADIUS

Modify Arc Angle

Extend or shorten the length (sweep angle) of an arc.

 To modify the length (sweep angle) of an arc:

1. Select the Modify Arc Angle button.
2. Select the arc you wish to modify. Adjust the sweep angle as needed.

Key-in: MODIFY ARC ANGLE

Modify Arc Axis

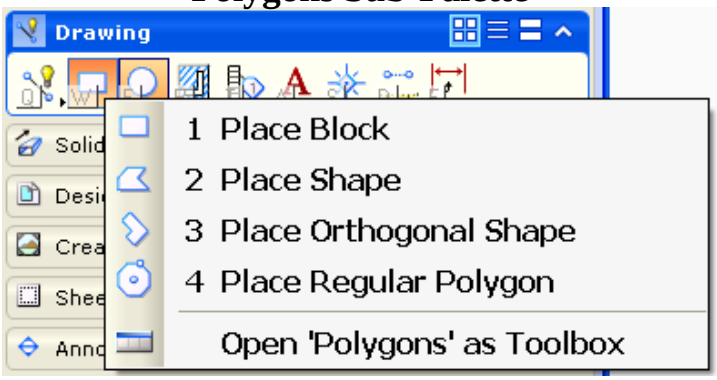
Change the major or minor axis radius of an arc.

 To modify the major or minor axis radius of an arc:

1. Select the Modify Arc Axis button.
2. Select the arc you wish to modify. Adjust the axis radius as needed.

Key-in: MODIFY ARC AXIS

Polygons Sub-Palette



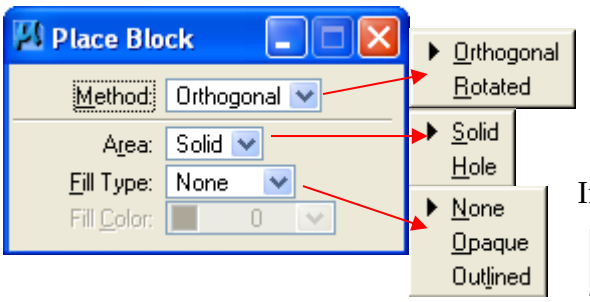
Another of the most basic palettes is the Polygons Sub-Palette.

Place Block

Place a regular four-sided polygon.

To place a block:

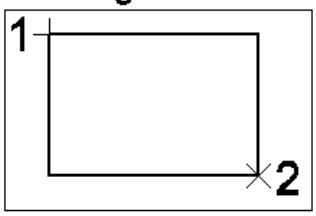
1. Select the Place Block button. A Tool Settings Window will appear.
2. Using the drop-down menu next to “Method,” choose either “Orthogonal” or “Rotated.” An orthogonal block will be oriented on the locked x- and y-axes and is established with two data points, while a rotated block can be oriented in any direction and is established with three data points. Next, choose the Area and Fill types (same choices as previous shapes).
3. Place your cursor over a point in the workstation and enter your first data point. If method is set to Rotated, enter a data point to define the orientation. Then (for either method), define the dimensions of the block by placing your last data point; this point should be diagonally opposite the first data point.



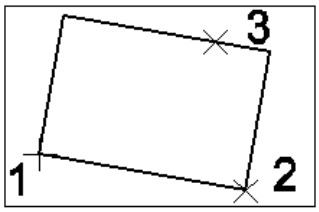
Key-in: PLACE BLOCK ICON or PLACE BLOCK [ORTHOGONAL | ROTATED]

If done with accudraw option on:

Orthagonal Block



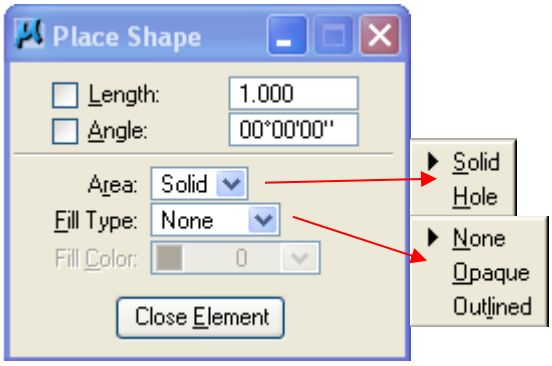
Rotated Block



Place Shape

To place a shape:

1. Select the Place Shape element. A Tool Settings Window will appear; set the Area and Fill types.
2. If you want the shape to be particular dimensions, you can set the Length and Angle options to the desired measurements. If not, simply enter data points in the workstation to make your shape.
3. To close your shape, you can do one of three things. Either use the Close Element button in the Tool Settings Window, or simply close the element by dragging your cursor back to the beginning data point. For those who like Key-ins, you can also use the command CLOSE ELEMENT



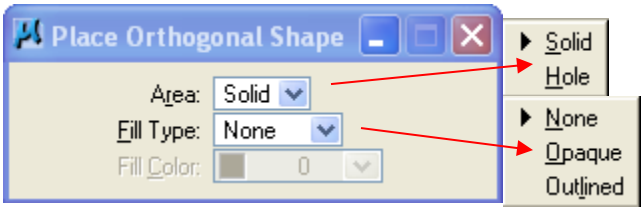
Key-in: PLACE SHAPE CONSTRAINED

Place Orthogonal Shape

Place a shape in which each segment is perpendicular or parallel to the others.

To place an orthogonal shape:

1. Select the Place Orthogonal Shape element. A Tool Settings Window will appear.
2. Set the Area and Fill Types and place your shape.



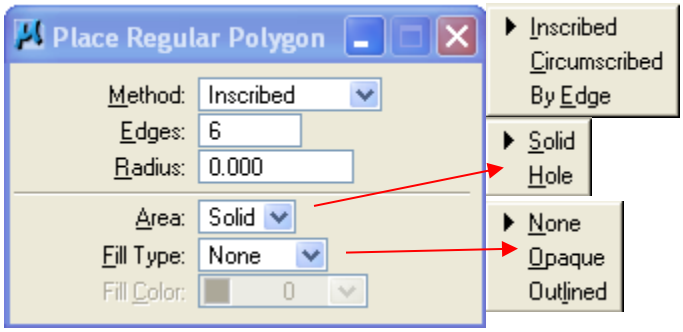
Key-in: PLACE SHAPE ORTHOGONAL

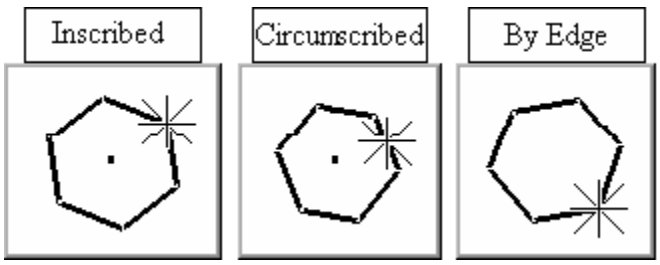
Place Regular Polygon

Place a regular polygon.

To place a regular polygon:

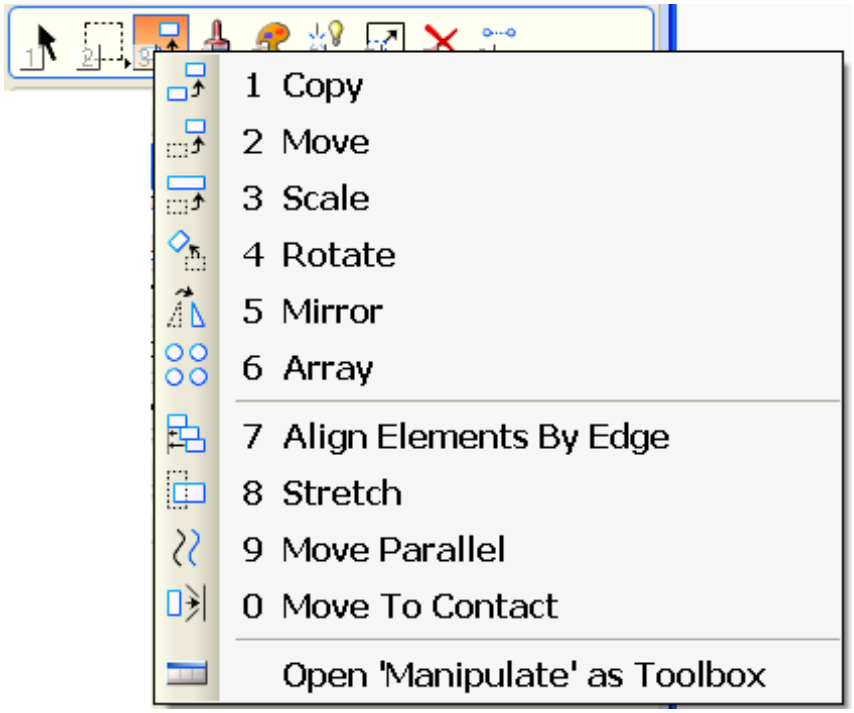
1. Select the Place Regular Polygon element. A Tool Settings Window will appear. Select the Area and Fill Types.
2. Select your Method; you may choose from Inscribed, Circumscribed, or By Edge. Both Inscribed and Circumscribed are placed by selecting the center point and moving outward; however, "Inscribed" is controlled by a vertex point and Circumscribed is controlled by an edge point.
3. Next, enter the number of sides you want your polygon to have in the Edges field. At this point, you may enter your first data point and drag your cursor out until your polygon is the desired size and has the desired orientation. However, if you want your polygon to be a specific size, you may enter the radius into the Radius field and simply rotate your polygon until it has the desired orientation.





Key-in: PLACE POLYGON ICON or PLACE POLYGON [INSCRIBED | CIRCUMSCRIBED | EDGE]

Manipulation Sub-Palette



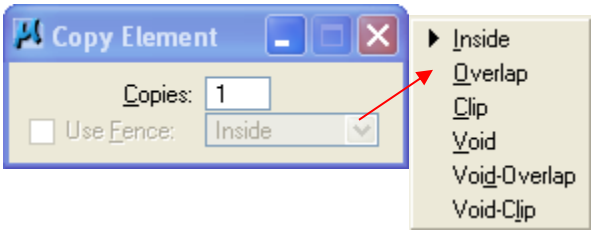
The Manipulation Sub-Palette is probably one of the most important sub-palettes in MicroStation. It contains all the tools you need to manipulate any element.

Copy Element

Copies an element or group of elements to a new location.

To copy an element:

1. Select the Copy Element button. A Tool Settings Window will appear. Choose the number of copies you wish to make and select the element or group of elements you wish to copy.
2. Move the copied image to its new location and enter a data point.



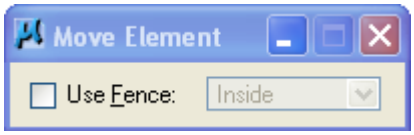
The Use Fence options are only if you have used a fence to decide what to copy. Fences will be covered later in the course.

Key-in: COPY ICON or [FENCE] COPY [ELEMENT

Move Element

Move an element to a new location.

Moving an element is exactly the same as copying an element, with the one exception that the Copies field is not turned on.



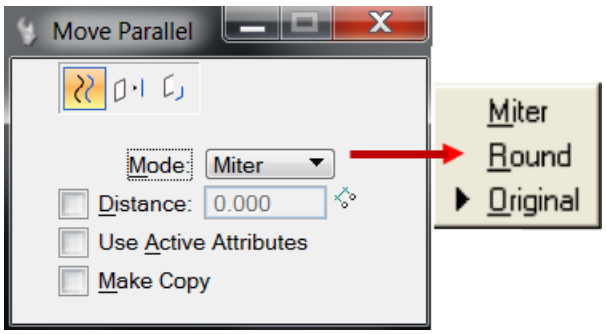
Key-in: MOVE ELEMENT or [FENCE] MOVE [ELEMENT]

Move/Copy Parallel

Move or copy an element parallel to original orientation.

To move/copy an element parallel:

1. Select the Move/Copy Parallel element. A Tool Setting Window will appear.
2. Choose the desired Mode from Miter, Round, or Original. Probably the most used Mode at MDT is the Original mode; the Original mode maintains the element type of the original element. However, in the case of Arcs and Ellipses, that the resulting element is not a true parallel. The Miter mode creates a true parallel in the case of Arcs and Ellipses, but the true parallels are b-spline curves rather than Arcs and Ellipses. So, if you want to maintain the original shape, use the Original mode, but if you want to create a true parallel, use the Miter mode. The Round mode simply rounds corners in polygons and lines.
3. Once you have chosen your mode, you may click on the element you wish to move/copy. Drag your cursor to the new location and enter a data point. If you want the element or element copy to move a certain distance, you can turn on the Distance field and enter the desired distance.
4. Turning the "Make Copy" field on or off works like a toggle, switching between Copy Parallel and Move Parallel.
5. Turning the "Use Active Attribute" field on will change the attributes of the copied or moved element to the current active attributes; leaving it off will mean the copied or moved element will maintain the original attributes.



Key-in: MOVE PARALLEL ICON or [COPY | MOVE] PARALLEL [DISTANCE | KEYIN]

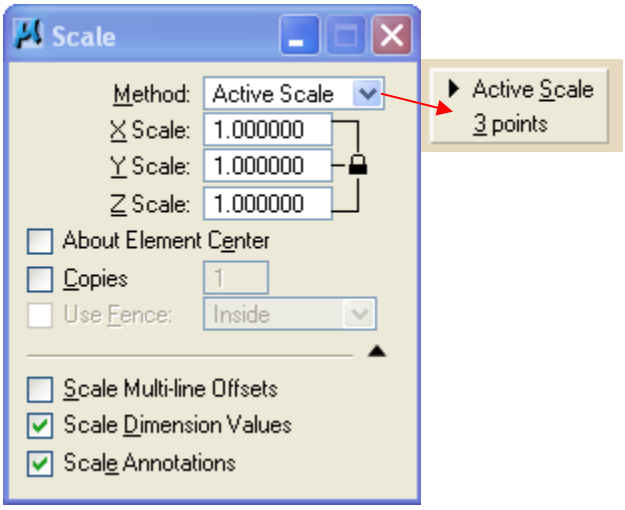
Scale Element

Resize an element.

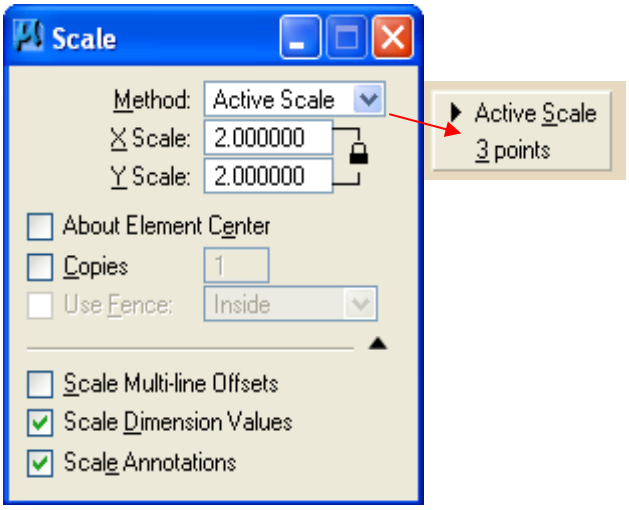
To resize an element:

1. Select the Scale Element button; a Tool Settings Window will appear.
2. Choose the Method you wish to use from Active Scale or 3 Points. If you choose Active Scale, you may set the increment by which the element(s) will be scaled. If you choose 3 points, you can manually select three points around which the element(s) can be scaled.
3. You may also choose whether you wish to make copies of the original element or simply to scale the original.

3D File Options



2D File Options



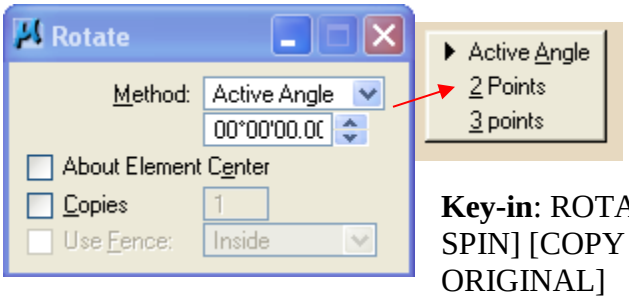
Key-in: SCALE ICON or [FENCE] SCALE [POINTS] [COPY | ORIGINAL]

Rotate Element

Rotate an element.

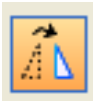
To rotate an element:

1. Select the Rotate Element button; a Tool Setting Window will appear.
2. Choose your Method. If you choose Active Angle, you can enter in the desired rotation. With 2 Points, you select two points and rotate the element around them. 3 Points is the same, but with three points instead of two.
3. Again, you may choose to make a copy or not.



Key-in: ROTATE ICON or [FENCE] [ROTATE | SPIN] [COPY | ORIGINAL | POINTS] [COPY | ORIGINAL]

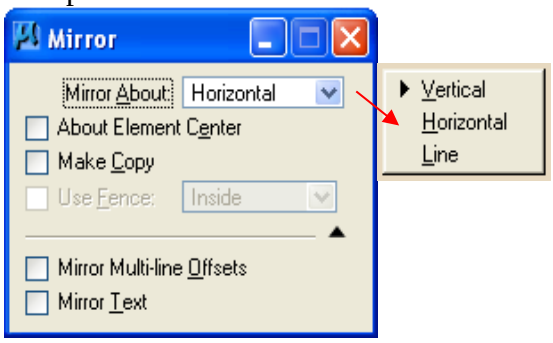
Mirror Element



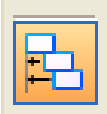
Mirror an element.

To mirror an element:

1. Select the Mirror Element button; a Tool Settings Window will appear. Again, you may choose to make a copy or not.
2. Choose the direction in which you want the element to be mirrored by using the drop-down menu next to "Mirror About." You may choose Vertical, Horizontal, or Line: Vertical will mirror across a vertical axis, Horizontal will mirror across a horizontal axis, and Line will mirror across a line you establish by selecting two points.



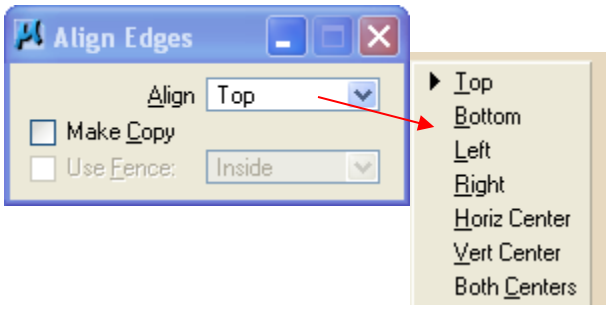
Key-in: MIRROR ICON or [FENCE] MIRROR [COPY | ORIGINAL] [HORIZONTAL | LINE | VERTICAL]



Align Elements by Edge

To align elements by edge:

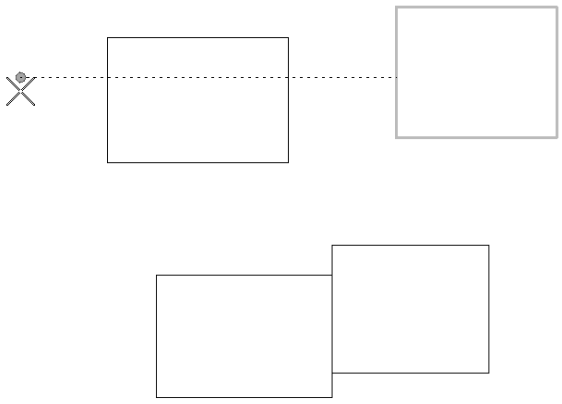
1. Select the Align Elements button; a Tool Settings Window will appear.
2. Use the drop-down menu next to “Align” to select the edge by which the elements should be aligned with.
3. Select the element with the desired alignment, and then click twice on each element you want to have the same alignment. Click the Reset button when all of the desired elements are aligned.



Key-in: ALIGNEDGE

Either 2D or 3D move one or more elements in a defined direction until they make contact with another element. If no element is in the path, then the element is not moved.

Box on right stops at first contact as below:

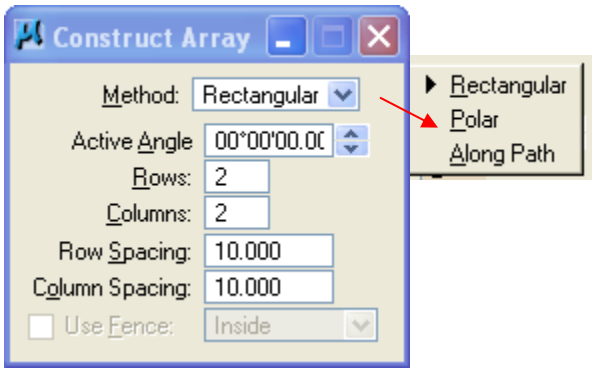


Construct Array

Copy an element many times to create an array.

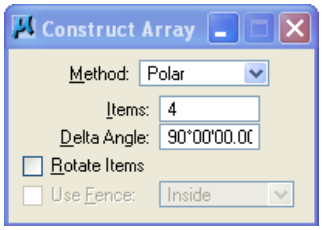
To construct a rectangular array:

1. Select the Construct Array element; a Tool Settings Window will appear. Depending upon the Array Type you choose, the Tool Settings Window will look differently.
2. Choose “Rectangular” for the Array Type. Next choose the Active Angle; you may choose one of the four preset angles (90˚, 180˚, 270˚, or 360˚) or type in your own angle.
3. Now select the numbers of Rows and Columns in the array; you may keep the default (two) or type in your own. Lastly, choose the spacing between each Row and Column.
4. Select the element you wish to copy by using the Data Button, and make the copies by hitting the Data Button again.



To construct a polar (circular) array:

1. Select the Construct Array element; a Tool Settings Window will appear. Depending upon the Array Type you choose, the Tool Settings Window will look differently.
2. Choose “Polar” for the Array Type. Next, you will need to select the number of Items (copies – include original element in this number) and the Delta Angle (angle between each copy). Decide if you want the copies to be rotated or not.
3. Select the element you wish to copy by using the Data Button and make the copies by hitting the Data Button a second time.

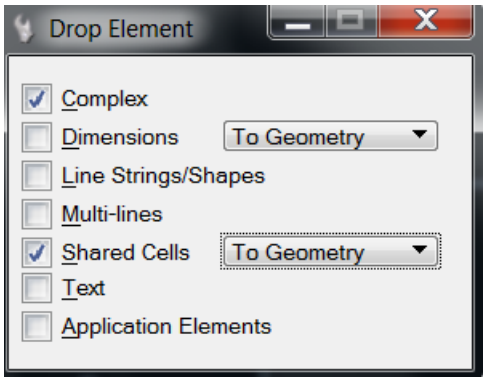


Key-in: ARRAY ICON or [FENCE] ARRAY [RECTANGULAR | POLAR]

Drop Element

Drop status on an element. To drop status on an element means it will break up the complex elements into their individual components

Drop Complex Status



1. Select the Drop Complex Status tool.
2. Identify the complex element.
3. Accept the drop.
4. Other element status can be dropped also.

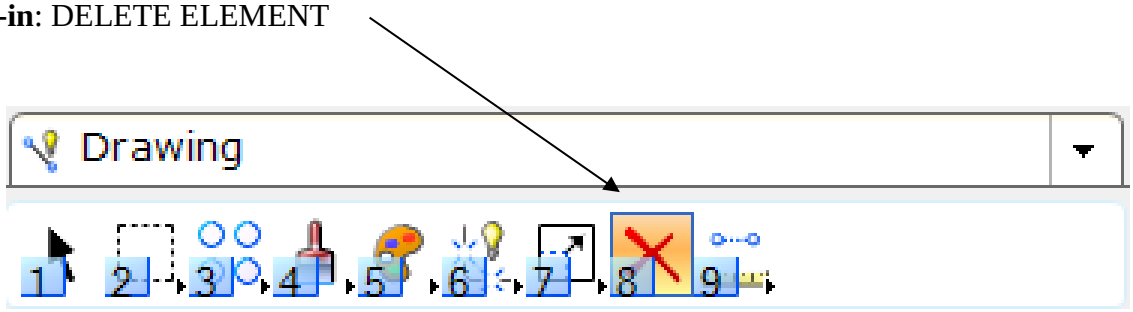
Key-in: Drop Complex

Delete Element Command

Delete Element: Deletes elements.

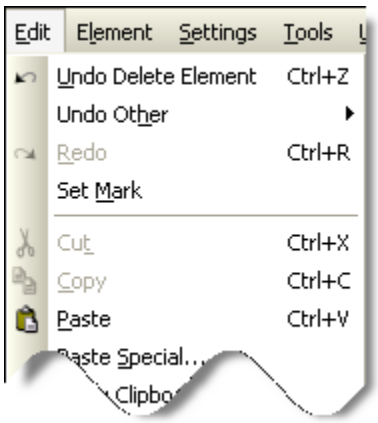
There are several ways to go about deleting design elements. You may select the Delete Element button and then Data click on the element you wish to delete. This will highlight the element and then data click again to accept and delete it. You may also use the element selection tool to select the element(s) you wish to delete. Then hit the Delete button. You may also select the element you wish to delete and pick the <Delete> or <backspace> key on the keyboard.

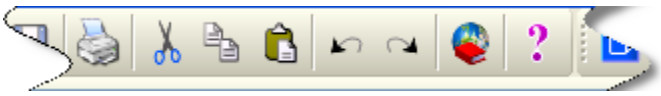
Key-in: DELETE ELEMENT



Editing

While drafting you are likely to make mistakes. Luckily, MicroStation comes equipped with an edit function. In addition to the more commonly found Cut (Ctrl+X), Copy (Ctrl+C), Paste (Ctrl+V), Undo (Ctrl+Z) and Redo (Ctrl+R) functions; MicroStation also comes with the "Undo To Mark" and "Undo All" functions.





You can access most of these functions by going to the Edit menu and selecting whichever function you need. These tools are also located in the Standard Tool Bar, which should docked with the Tool Bars at the top of the screen (though it can be moved anywhere). If this Tool Bar is not on when you open MicroStation, you can turn it on by accessing the Tools menu and selecting "Standard."

Commands:

Undo

Will Undo Last Placement or Element Manipulation.
Undo Command to Last Compress.

Key-in: Undo

Undo All

Will undo everything that has been done since the last time the file was compressed.

Key-in: UNDO ALL

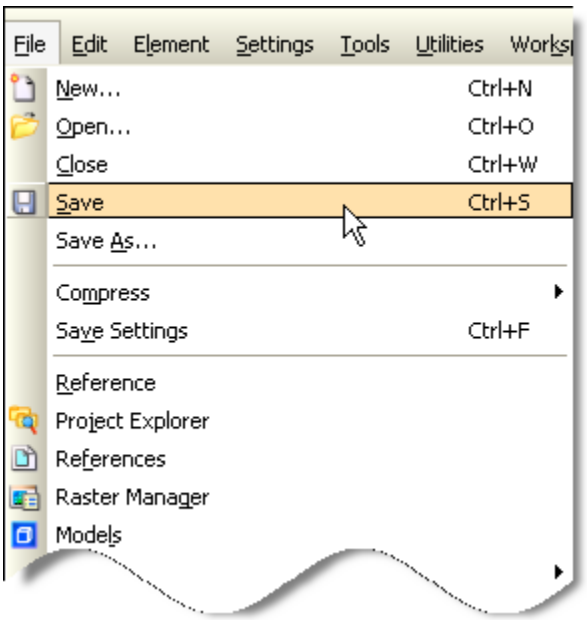
Undo to Mark

Will undo everything that has been done since the last time you set a Mark. You set a mark by going to the Edit menu and selecting "Set Mark."

Key-in: UNDO MARK

Saving a File

MicroStation is continually saving your design file.
Save As will save your file with a new name and in a location, that you designate and then closes the open DGN file and opens the newly saved DGN file.
Save will save your file at that particular moment. This option is used if you have the automatic save settings turned off. This is not covered in this course. You should keep this option on all the time.



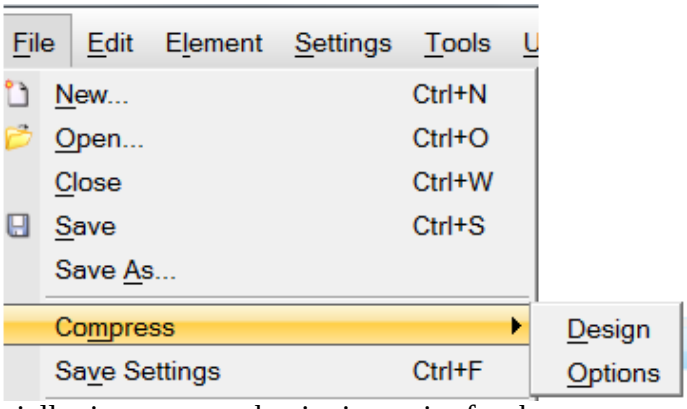
Backing Up a File

Backing up a file is executed by typing Backup in the Key In Browser command line. It will automatically place a file in the C:\Dgn directory with a .BAK extension rather than .DGN extension. It will not automatically open up the DGN file.

Key-in: BACKUP

Compressing a File

Every time you place, move, modify, or delete an element it takes up space on the memory buffer. Using the undo and redo functions also takes up space on the memory buffer. In fact, you can use up enough space that it becomes difficult to use any of those functions; in order to avoid slowing (or stopping altogether) your use of these basic utilities you need to compress your files. Compressing a file is like wiping the computer's memory of when you placed, moved, modified, or deleted elements. It still recognizes that the elements are there in the file, it just does not remember the steps taken to place the elements wherever they are. Essentially, it sets a new beginning point for the design. You can still move, change, or delete old elements and add new ones, you just can't undo (or redo) anything from before you compressed the file.



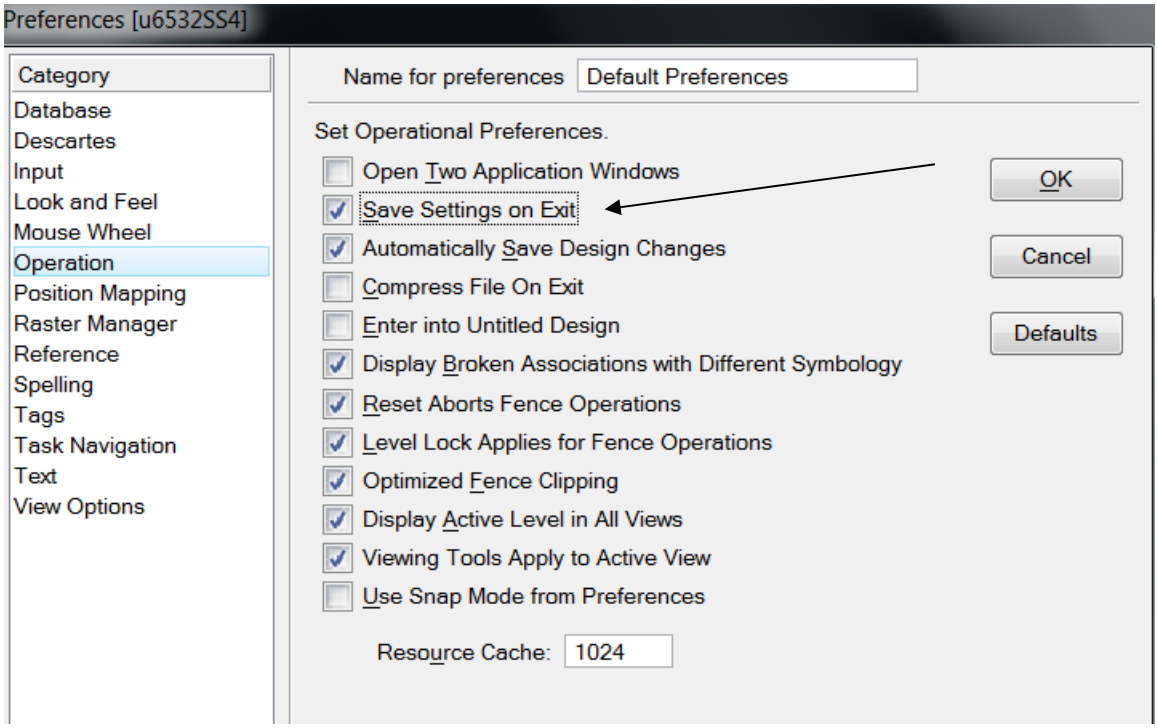
You compress a file by going to the File menu, placing your cursor over "Compress" until the drop-down menu opens, then select "Design." If you haven't compressed your file in while it will take longer than if you compress it fairly often. In fact, you can set your design files to compress whenever you exit MicroStation, so you do not have to repeat the compression process. Simply go to the Workspace menu and select Preferences. A dialog window will appear. Once the Dialog Window opens, select the "Operation" Category. Next turn on the "Compress File On Exit" Operational Preference. Click OK and the file will compress every time you exit the file. This is recommended if you check out and check in files from DMS.

Key-in: COMPRESS

Save Setting

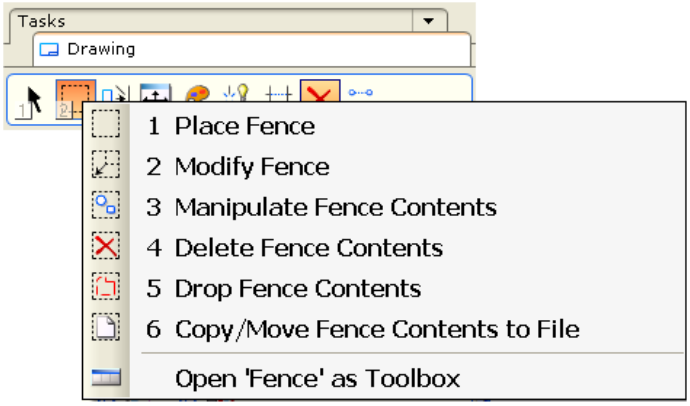
Another Operational Preference you may want to take advantage of is the "Save Settings on Exit" preference. Turning this preference on means that all of the settings you are using at the time you exit the file will be the same when you next open the file. For example, any Sub-Palettes you have ripped will stay where you put them and any menus you have moved or turned on or off will remain that way. To utilize this preference, go to the Workspace menu and choose preferences again. This setting is also under the "Operation" Category. Turn it on and click OK. This can be done at any time by opening the File → Save Settings or type in "Ctrl F".

WORKSPACE > PREFERECNES > OPERATION

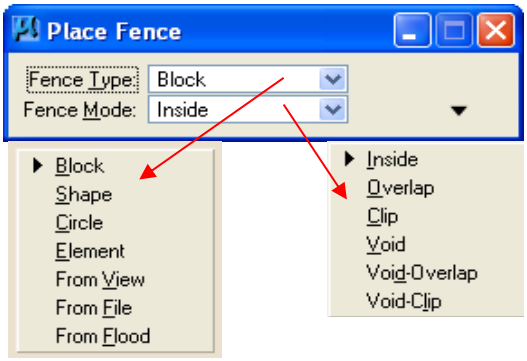


CHAPTER 2

Fence Sub-Palette



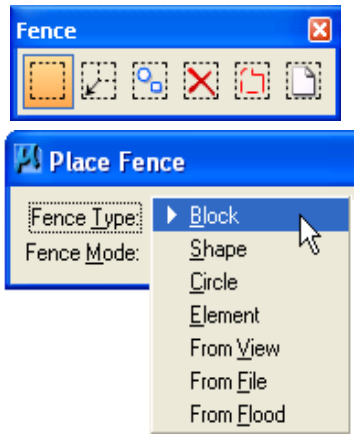
Fence Contents Locks



INSIDE (default) - Affects elements completely enclosed by fence.
OVERLAP - Affects elements inside or crossing the fence.
CLIP - Affects elements or parts of elements enclosed by fence.
VOID - Affects elements completely outside fence.
VOID – OVERLAP - Affects elements outside and crossing the fence.
VOID – CLIP - Affects elements or parts of elements outside fence.

Fence Window

It will be shaded **Green** or **Red**. Green is for **Inside** commands and red is for **Void** commands and have a solid line around the fence. **Overlap** and **Clip** have different dashed lines for **Inside** and **Void**.



Place Fence Block

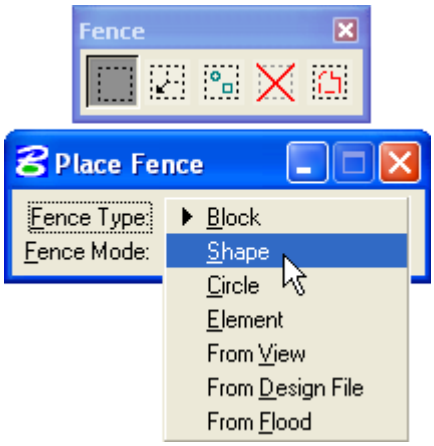
Places a rectangular fence around a particular user defined area.

1. Enter data point to define Select Place Fence tool. If a fence exists, it is removed.
2. Enter data point to define one corner.
3. diagonal point

Key-in: Place Fence Block

Fence Shape

Places a multi-sided fence around a particular user defined area

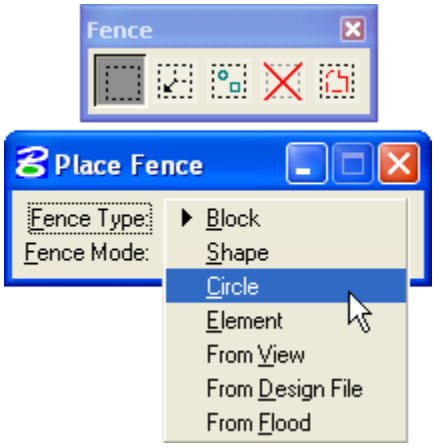


1. Select Place Fence tool. If a fence exists, it is removed.
2. In the Tool Settings window, set Fence Type to Shape.
3. Enter a data point to define the beginning (and end) point.
4. Continue to enter data points to define the vertices.
5. To close the shape, enter a data point at the location of the first data point.
6. Or click the Close Fence button.

Key-in: Place Fence Shape

Fence Circle

Places a circular fence around a particular user defined area.

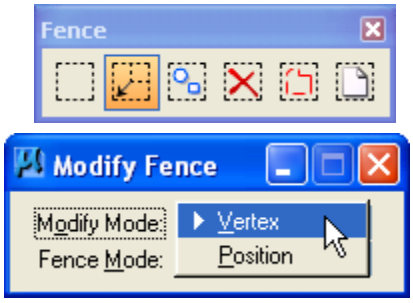


1. Select the Place Fence tool. If a fence already exists, it is removed.
2. In the Tool Settings window, set Fence Type to Circle.
3. Enter a data point to define the center.
4. Enter a data point to define the radius.

Key-in: Place Fence Circle

Modify Fence Vertex

User modifies an existing corner location of a fence.



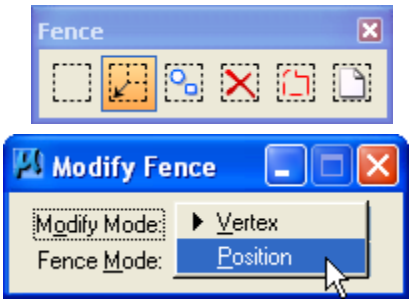
1. Select the Modify Fence tool.
2. Set the tool setting Modify Mode to **Vertex**.
3. Identify the vertex to move.
4. Enter a data point to define the new vertex position.
5. Reset to accept the modification.

Key-in: Modify Fence

Modify Fence Position

Move Fence

User moves a fence to a different location.



1. Select the Modify Fence tool.
2. Set the tool setting Modify Mode to Position.
3. Enter a data point to define the origin for the move.
4. Enter a data point to define the new fence position.

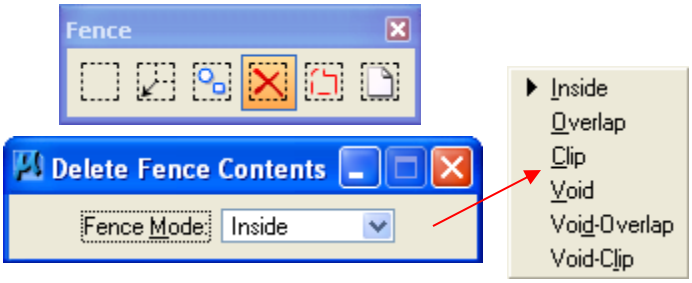
This data point precisely positions the origin.

5. Reset to accept the move.

Key-in: Move Fence

Delete Fence Contents

User deletes elements entirely inside of fence

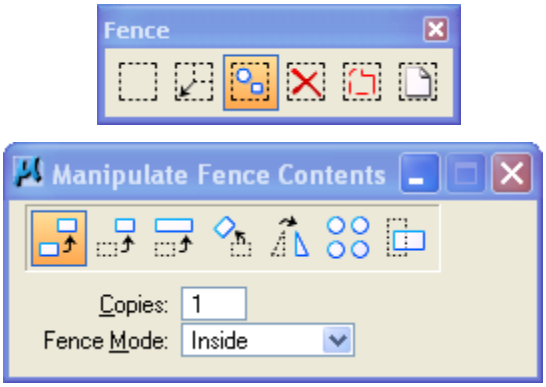


1. Select Delete Fence tool.
2. Accept the deletion

Key-in: Fence Delete

Copy Fence Contents

User can manipulate elements inside of fence.

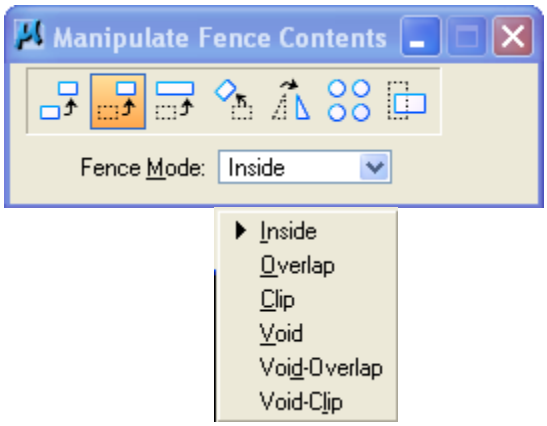


1. Fence elements.
2. Determine fence mode.
3. Select the Copy tool.
4. Identify the origin of the elements.
5. Enter data point(s) to position each copy.
6. Reset to finish.

Key-in: Fence Copy Element

Move Fence Contents

User can move fence contents.

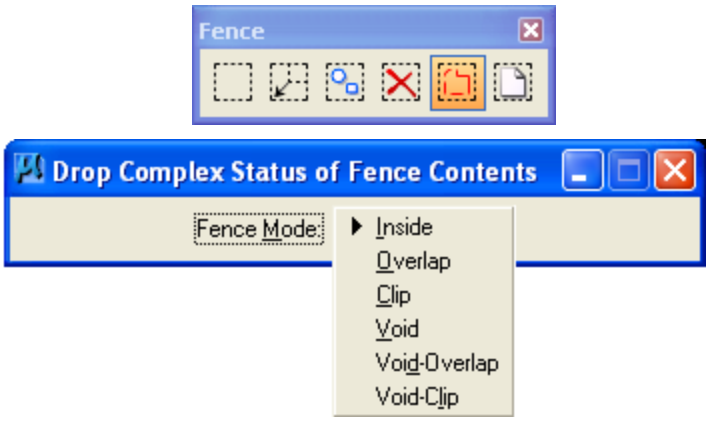


1. Fence elements.
2. Determine fence mode.
3. Select the Move tool.
4. Identify the origin of the elements.
5. Enter data point(s) to re-position the fenced elements.
6. Reset to finish.

Key-in: Fence Move Element

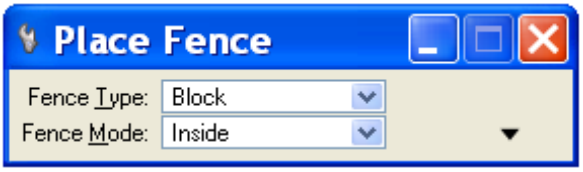
Drop Fence Contents

User can drop status on elements in fence. To drop status on an element means it will break up the complex elements into their individual components.

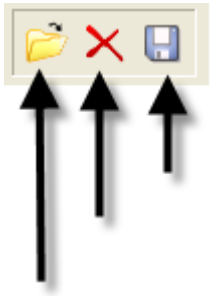


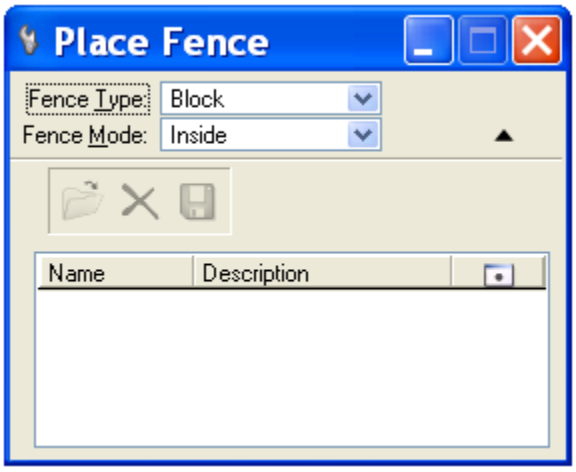
1. Fence elements.
2. Determine fence mode.
3. Select the Drop Status tool.
4. Enter data point in fence.

V8i provides the capability to save fences with a name and or a description to be recalled for usage at later time:

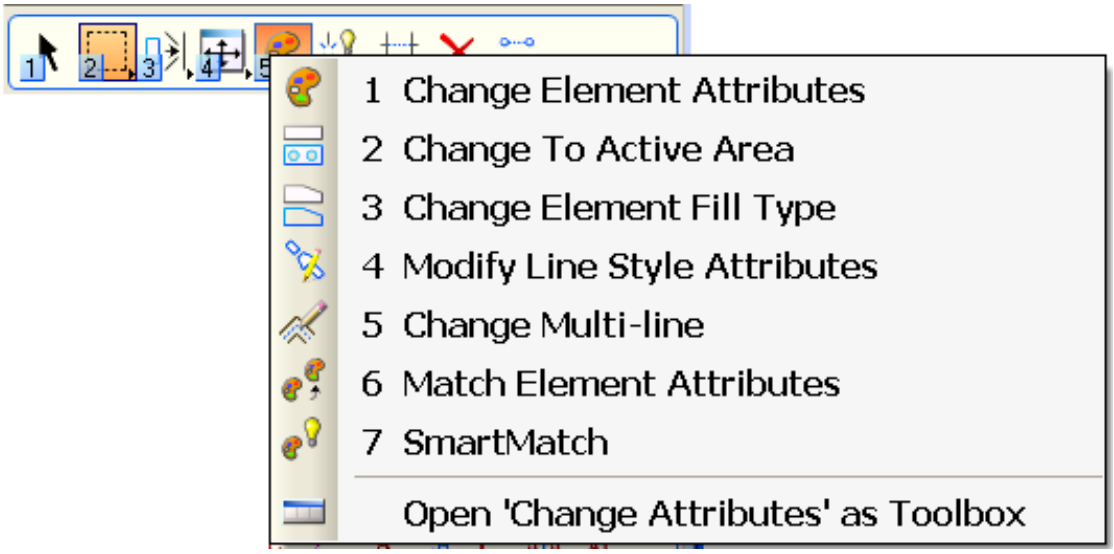


Activate
Delete
Save



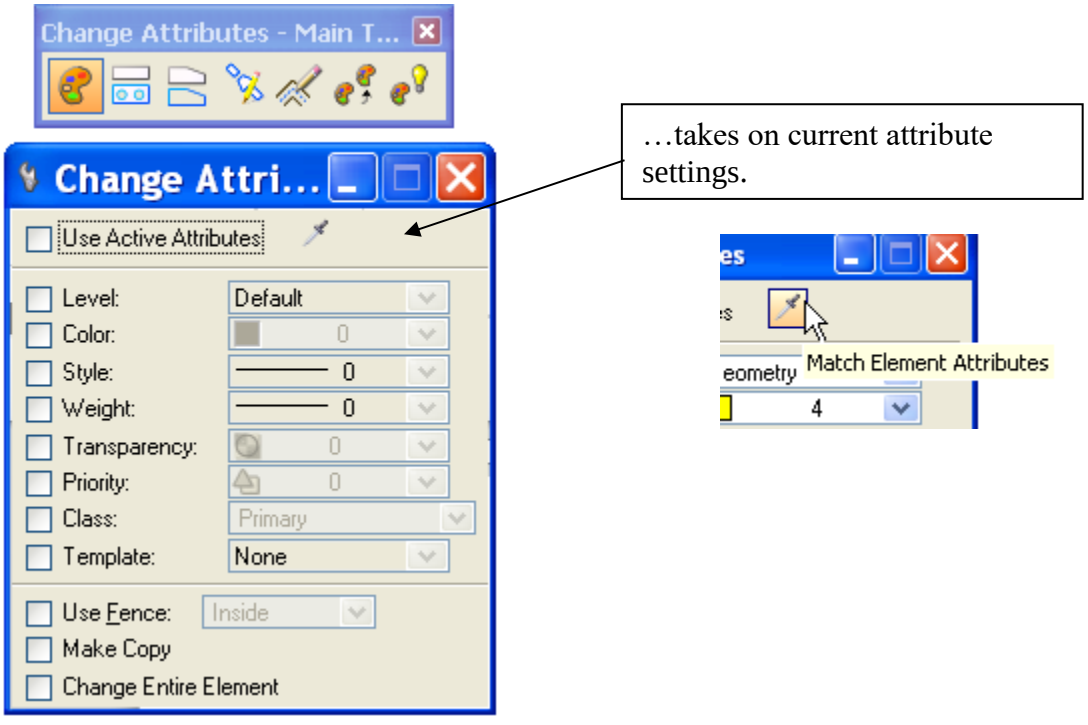


Attribute Palette



Change Element Sub-palette

A user can change the symbology of an element.

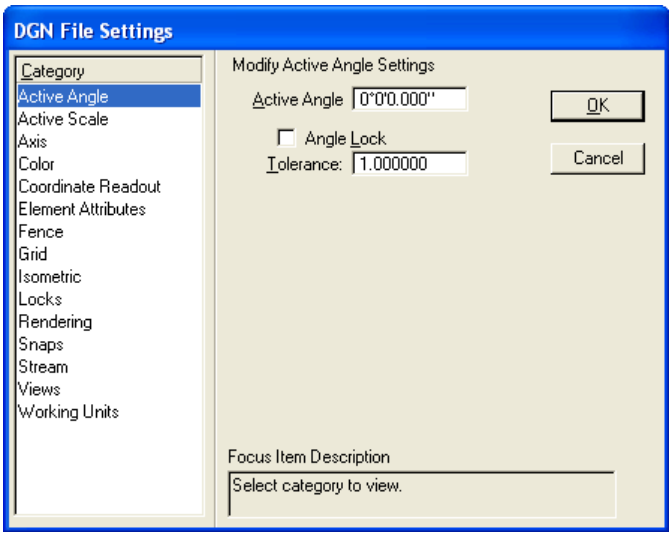


Select Change Element Attribute tool.

1. Toggle on attributes to be changed.
2. Identify the element.
3. Accept to change.

Click on eye dropper to activate Match Element Attributes option.

Change Element Attributes: Change an element(s) attributes to the active setting(s)
Change to Active Area: Change the area of a closed element(s) to the active area.
Change to Active Fill Type: Change a closed element to the active fill type.
Modify Line Style Attributes: Dynamically modify the line style attributes of an element.
Change Multi-Line: Change a multi-line's attributes to the active definition.
Match Element Attributes: Change the active attributes to match those of an existing element.
SmartMatch: Match all element settings.



From Settings menu, choose Design File

Active Angle

Angle - set active angle

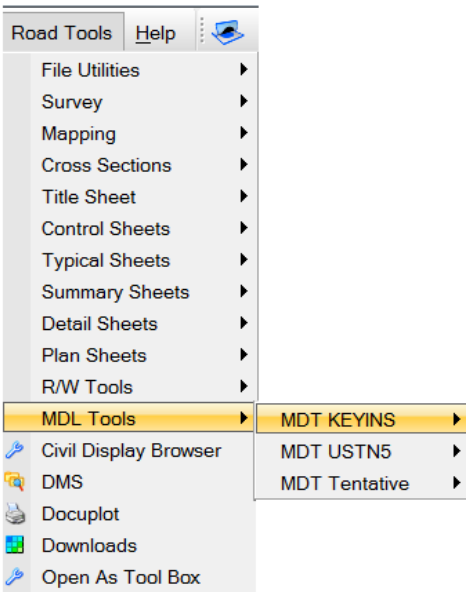
Angle Lock - rounds angle to tolerance

Tolerance - factor that angle lock rounds to

Key-in: **AA= [angle]**

(Use text placement to demonstrate AA= changes)

MDT MDL TOOLS



Set Active Angle Graphically by 2 points
(From **Road Tools** > **MDT Tools** > **MDT KEYINS**)

1) Enter data point for origin of an imaginary line

2) Enter data point for endpoint of line

Key-in **Active Angle Pt 2**

Note: The Active Angle is set to the angle measured counter-clockwise between this line and the positive view x-axis.

Set Active Angle Graphically by 3 points
(From **Road Tools** > **MDT Tools** > **MDT KEYINS**)

1) Enter data point for endpoint of first side of angle

2) Enter data point for vertex of angle

3) Enter data point for endpoint second side of angle

Key-in **Active Angle Pt 3**

Note: The Active Angle is measured counter-clockwise from the first data point to the third data point.

Setting Active Scale Dialog
(From the **Settings** menu, choose **Design File...**)

Active Scale

X Scale - sets active x-scale

Y Scale - sets active y-scale

Lock Control - lock scale factor the same

1.0 - sets scale factor to 1.0

Half - multiply scale factor by 0.5

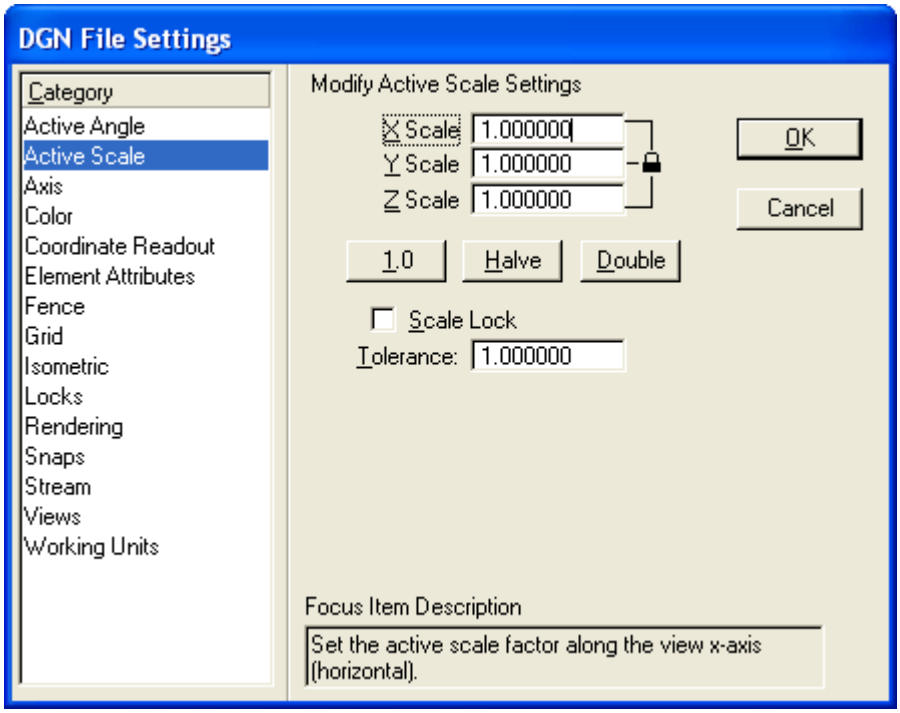
Double - multiply scale factor by 2

Scale Lock - rounds scale to tolerance

Tolerance - factor that scale lock rounds to

Key-in: **AS = [scale]**

Note: A 2D file will not have an option to scale in the Z.



Set Active Scale Graphically
(From **Tools** menu choose **MDT Custom - Keyins**)

1) Enter data point of known location or keypoint

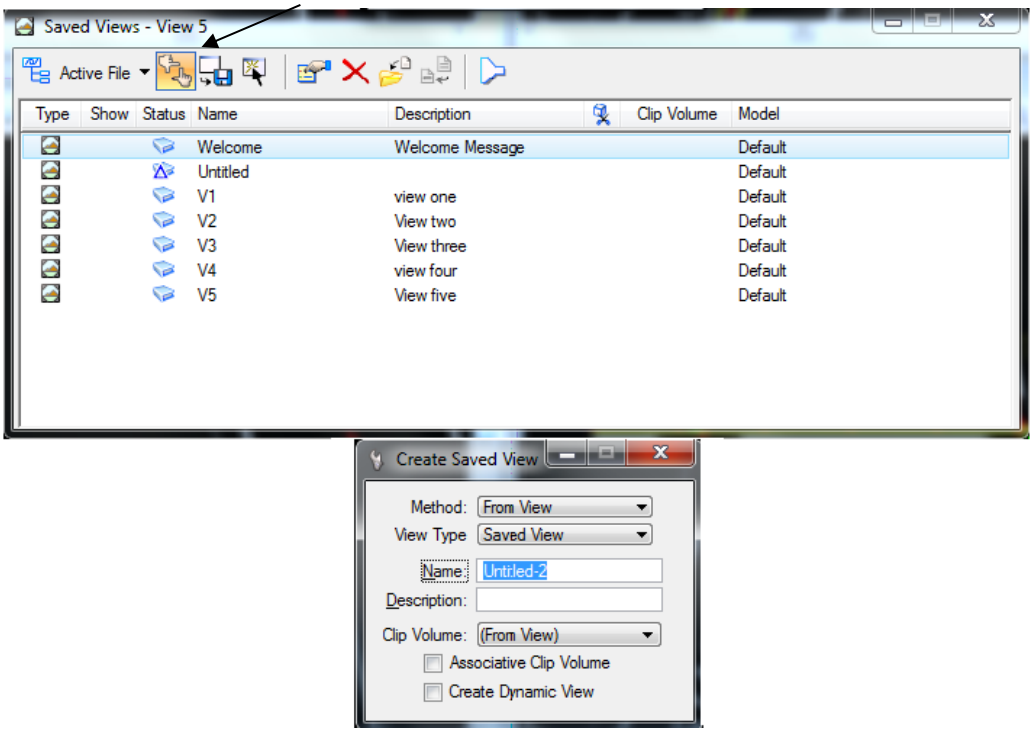
2) Enter data point of second known location or keypoint

3) Enter data point to define active scale factors

Key-in: **Active Scale Distance**

Saved Views

You have already learned how to navigate within and between views; however, one of the most helpful view features in MicroStation is one that you have yet to learn. In MicroStation you can save particular views in a design file for later use. This feature is located under: ***Utilities > Saved Views.***



Saving a View

Navigate the view in the workstation until you have the desired view, then select "Saved Views" in the Utilities menu. Click the create view button; a second dialog box will appear.

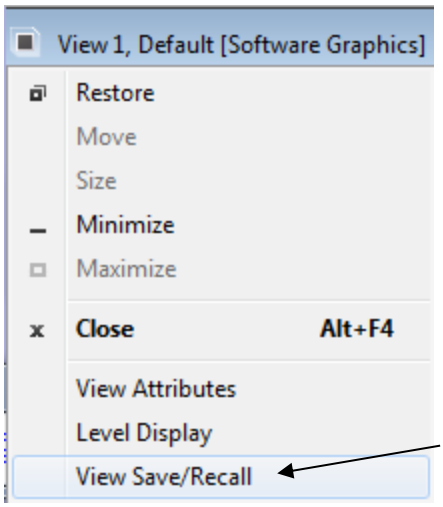
Fill out the Name, Description etc…dialogs as required then select the view you wish the save to be associated with.

Opening a Saved View:

To open a previously saved view, select "Saved Views" from the **Utilities** Menu. The **Saved Views** dialog window will open. Select the view you wish to apply and then select the view you wish to apply it to.

Deleting a Saved View

To delete a saved view, select the view from the Saved Views dialog window then click the saved view delete button.



Saved view selections are also available at the extreme left corner button of the MicroStation view.

CHAPTER 3

Snaps (Tentative Button)

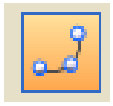
Snaps are probably one of the most useful tools in MicroStation, especially when it comes to placing, moving, or modifying elements. Snaps allow you to place, move, and modify with much more precision and accuracy; making it possible to join elements at precise points or using a point to define the orientation of an element**. To turn on the Snap Button Bar, go to the Settings Menu. Highlight the Snaps option; when the drop-down menu opens, choose "Button Bar."** The button bar will appear on the screen. You can also open the Snap Button Bar at the bottom of the screen in the status bar. When a snap button is grayed out it is the default choice. If you want to choose a different snap for your default, then double click on it and it will become grayed.

If you right click on any button and choose List, you can turn off any snap button and it will not be included in the Snap Mode palette. To turn it on just check it on.

Nearest Snap Point:

Using the Nearest Snap point allows you to snap to the nearest point on any element.

Key-In: SNAP <NEAREST>



Keypoint Snap:

This is the most generally useful of the snaps. It allows you to snap to the nearest Element Keypoint. Snaps to the nearest vertex.

Key-In: SNAP <KEYPOINT>

Midpoint Snap:

The Midpoint Snap allows you to snap to the midpoint of the segment closest to the pointer.

Key-In: SNAP <MIDPOINT>

Center Snap:

The Center Snap allows you to snap to the center of elements like ellipses, arcs, and text, and the centroid of shapes, line-strings, and B-splines.

Key-In: SNAP <CENTER>

Origin Snap:

The Origin Snap allows you to snap to the origin of a cell or text, centroid of a B-spline, the first data point of a dimension element, or the first vertex of a line, multi-line, line-string, or shape.

Key-In: SNAP <ORIGIN>

Bisector Snap:

The Bisector Snap allows you to snap to the midpoint of an entire line-string, multi-line, or complex chain, rather than to the midpoint of the closest segment. It will also snap to the midpoint of a line or an arc.

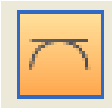
Key-In: SNAP <BISECTOR>

Intersection Snap:

The Intersection Snap allows you to snap to the intersection of two elements.

Key-In: SNAP <INTERSECTION>

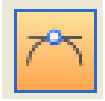
Tangent Snap:



Tangent Snap allows you to place lines tangent to a circle, ellipse, or arc. The Tangent Snap tentative point slides dynamically around the element to maintain tangency until you finish placing the element.

Key-In: SNAP <TANGENT>

Tangent From Snap:



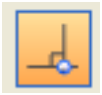
The Tangent From Snap works like Tangent Snap, except that the tentative point does not move dynamically, but is locked in place.

Key-In: SNAP <TANGENT_FROM>

Perpendicular Snap:

The Perpendicular Snap allows you to place lines perpendicularly from another line, a circle, ellipse, arc, or shape. The Perpendicular Snap tentative point slides dynamically along the element to maintain perpendicularity until you finish placing the element.

Key-In: SNAP <PERPENDICULAR>



Perpendicular Snap Point:

The Perpendicular From Snap works like the Perpendicular Snap, except that the tentative point does not move dynamically, but is locked in place.

Key-In: SNAP <PERPENDICULAR_FROM>

Parallel Snap:

The Parallel Snap allows you to place a line parallel to another line, line segment or shape.

Key-In: SNAP <PARALLEL>

Through Point Snap:

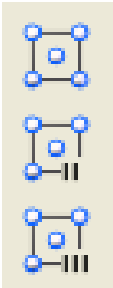
The Through Point Snap defines a point through which the element you are placing (or an extrapolation of it) must pass.

Key-In: SNAP <THROUGH_POINT>

Point On Snap:

The Point On Snap allows you to snap to the same element wherever you want it placed.

Key-In: SNAP <POINT_ON>



Multi-Snaps 1, 2, & 3:

The Multi-Snap buttons allow you to use multiple snaps at once. All three have default settings, but the defaults can all be changed. Multi-Snap 1's default setting is Intersection, Keypoint, and Nearest. Multi-Snap 2's is Intersection, Keypoint, and Center. And Multi-Snap 3's is Midpoint, Intersection, and Center.

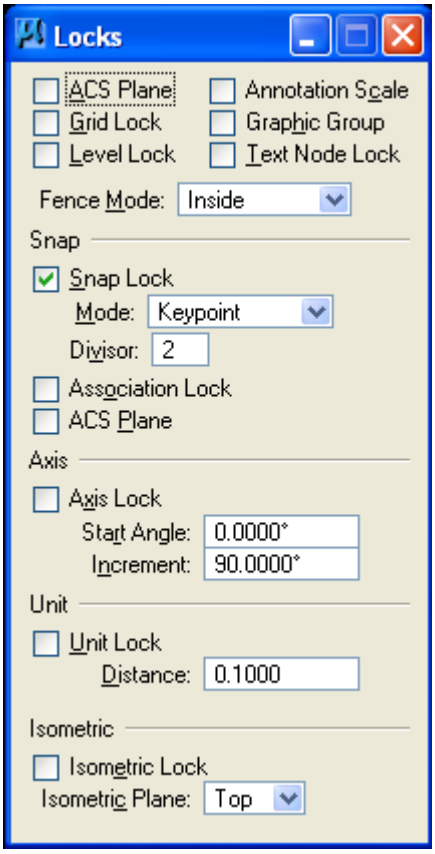
Key-In: SNAP <MULTISNAP1 | MULTISNAP2 | MULTISNAP3>

Locks

This menu has controls that are used to set locks for: Snap, Axis, Unit, Isometric, Grid, Levels, Text Nodes, and Graphic Groups.

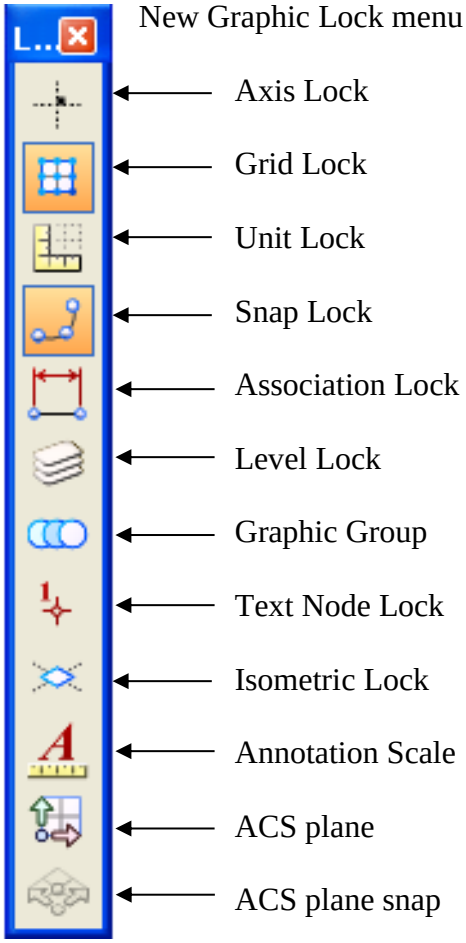
SETTING LOCKS-FULL SUB-MENU

SETTINGS>LOCKS>FULL



SETTING LOCKS TOGGLES-MENU.

SETTINGS>LOCKS>TOGGLES



To open locks menu go to **Settings** menu, choose **Locks-Full** or **Toggle**.

Settings and Toggles

This allows you to adjust various settings as well as toggle locks on and off.

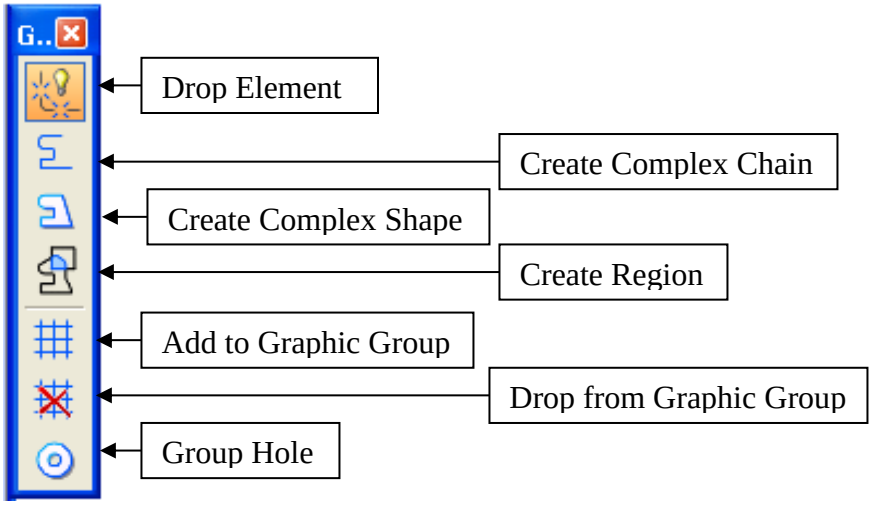
Axis Lock = Ortho

The START ANGLE is where the angles are measured from.

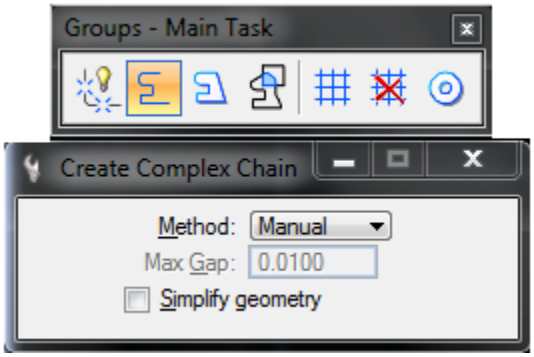
The INCREMENT defines where you will allow the element to be placed.

i.e. Start Angle = 0 and Increment = 90 will allow you to place lines at 0°, 90° and 270°

Group Sub-Palette



Create Complex Chain

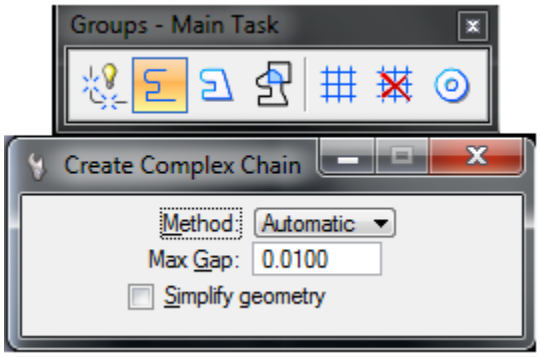


Manual

1. Select the Create Complex Chain tool.
2. Set method to manual. Identify the first element to add to chain.
3. Continue to identify elements to add to chain.
4. Reset to complete the chain.

Note: Maximum Gap is the greatest allowable distance between elements when the Method is Automatic. If the Maximum Gap is zero, only elements that connect are added

Key-in: Create Chain Manual

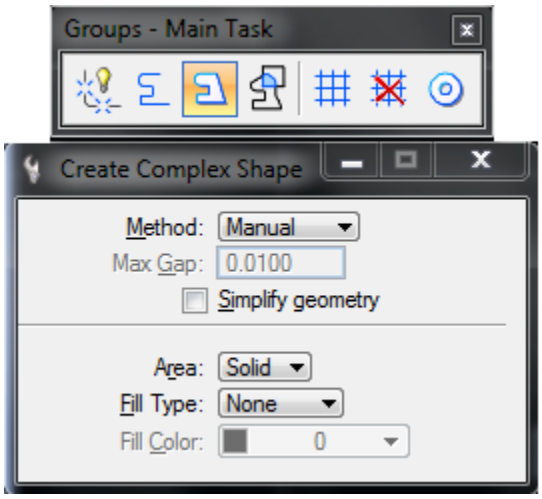


Automatic

1. Select the Create Complex Chain tool.
2. Set method to automatic.
3. Identify the first element to add to chain.
4. Identify another point along element and it will automatically chain entire line

Key-in: Create Chain Automatic

Create Complex Shape



Manually

1. Select the **Create Complex Shape** tool.
2. Set method to manual.
3. Area.

a. Solid - allows a shape to be filled or patterned.

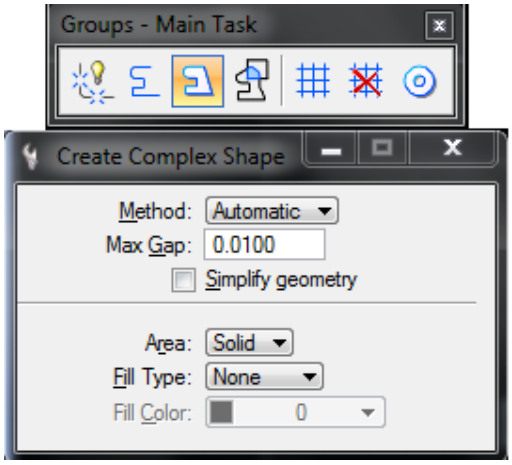
b. Hole - does not allow a shape to be filled or patterned.

Fill Type

(When manipulating element, select by edge)

1. None - creates a shape with no existing fill.
2. Opaque - fills the shape with the selected fill color.
3. Outlined - fills the shape with the fill color and outlines the shape with the active color.
4. Identify the first element to add to Shape,
5. Continue to identify elements to add to Shape.
6. Reset to complete the Shape.

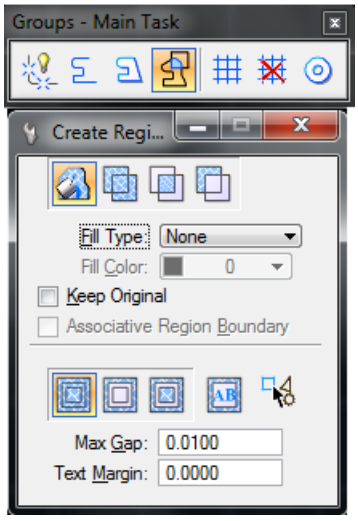
Key-in: Create Shape Manual



Create Complex Shape

1. Select the Create Complex Shape tool.

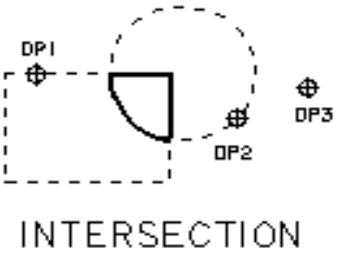
Key-in: Create Shape Automatic



Create Region

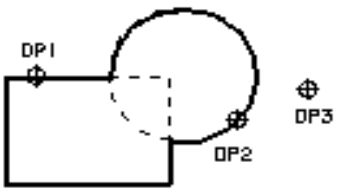
1. Select the Create Region tool.
2. Set method to Intersection, Union, Difference, or Flood (If *Keep Original* is on, the original elements remain in the design file)
3. Identify the first element
4. Identify other element(s)
5. Accept the complex shape(s)

Key-in: Create Region



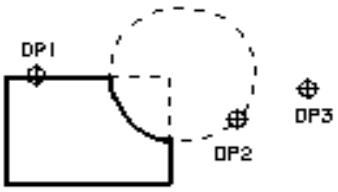
INTERSECTION

Intersection - Edges bound the intersection of two or more closed, planar elements.



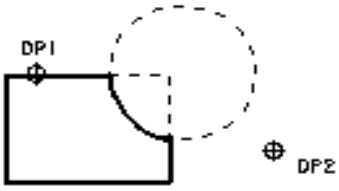
UNION

Union - Edges bound the union of two or more closed, planar elements.



DIFFERENCE

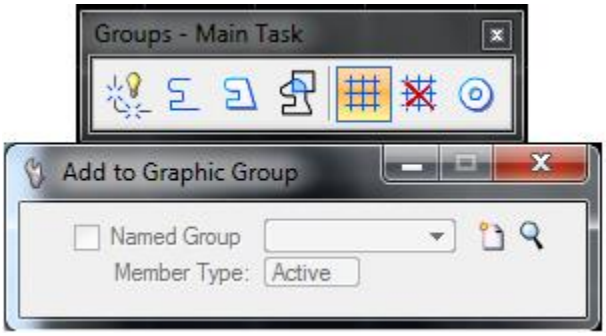
Difference - Edges bound the difference of two or more closed, planar elements.



FLOOD

Flood - Edges bound the area enclosed by elements that either touch one another or whose endpoints fall within the Maximum Gap

Graphic Groups



Add to Graphic Group

Add elements to the graphic group one by one with Add to Graphic Group tool in the Group Sub-palette.

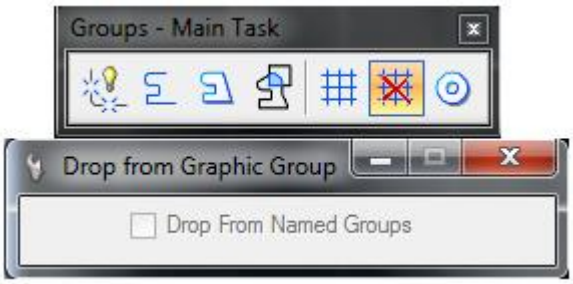
1. Select Add to Graphic Group tool.
2. Select each element to add to graphic group & accept.
3. Choose next command when done

Key-in: Group Add

<u>To manipulate:</u>

Manipulate with ELEMENT MANIPULATION commands. May need to UPDATE to see manipulation results.

1. Make sure Graphic Group Lock is on.
2. Choose manipulation command.
3. Choose one element in Graphic Group.
4. Follow manipulation command instructions.



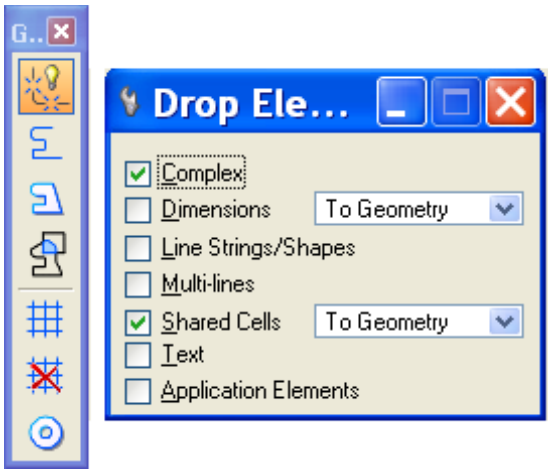
Drop from Graphic Group

1. Select the Drop from Graphic tool.
2. Set. Use Drop from Graphic Group tool in the Group Sub-palette to return to individual elements.
3. With the graphic group lock on: Elements are manipulated and dropped as a group
4. With the graphic group lock off: Elements are manipulated and dropped individually.

Key-in: Group Drop

Drop Line String/Shape Status

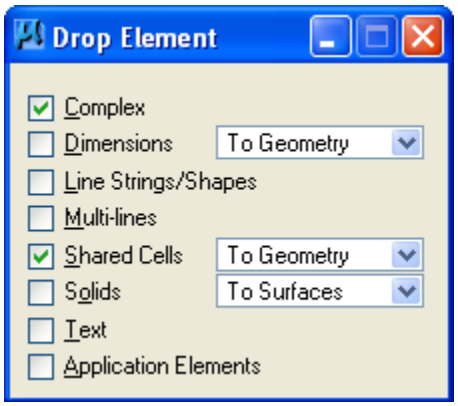
This command is available in two locations:



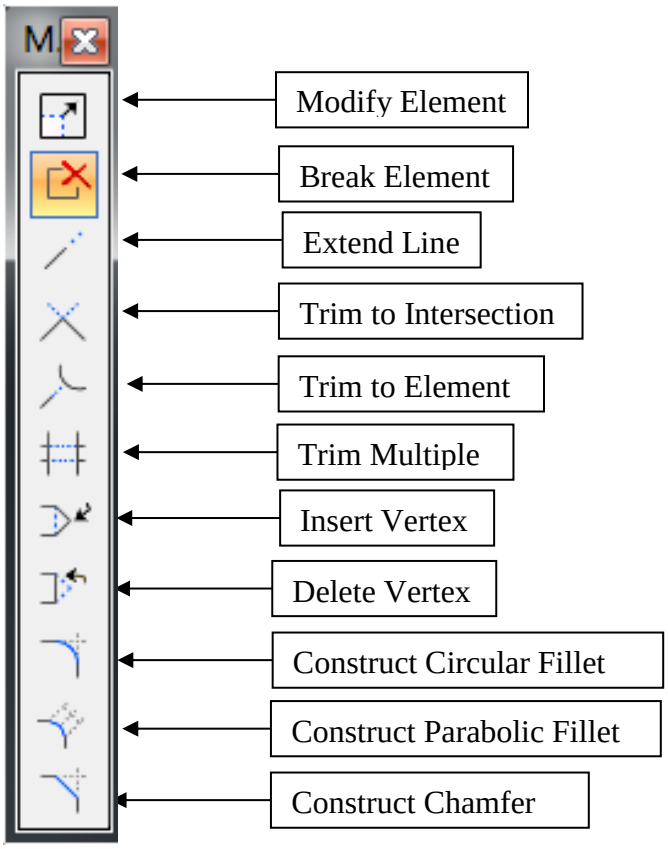
Or

1. Select the Drop Line String/Shape Status tool.
2. Identify the line string or shape.
3. Accept the drop

Key-in: Drop String \ Text



Modify Palette



Modify Element Sub-palette

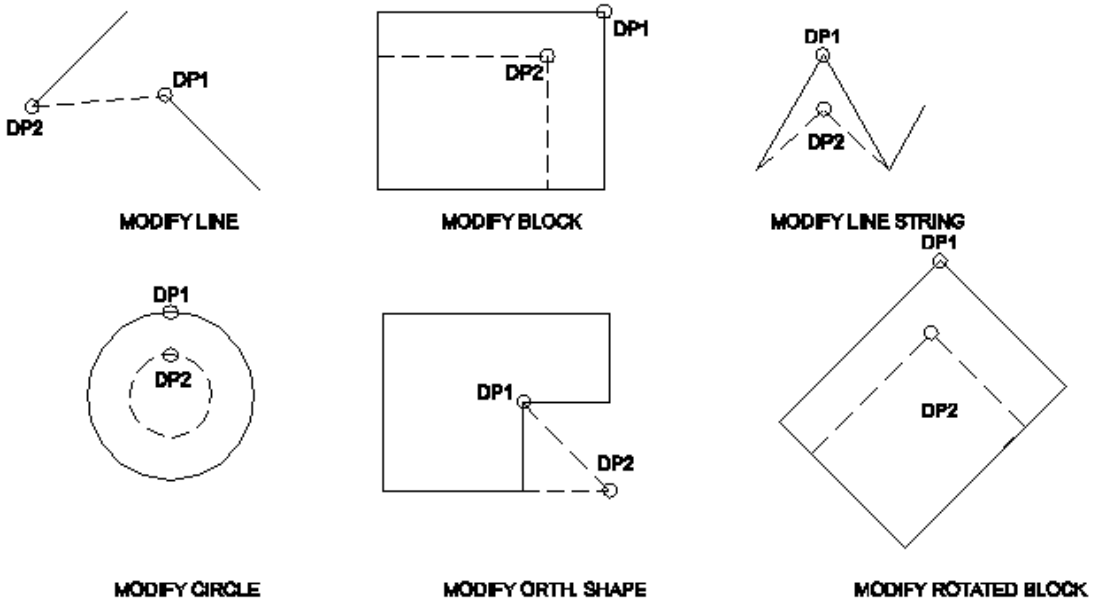
Modify Element

Users can modify an element by:

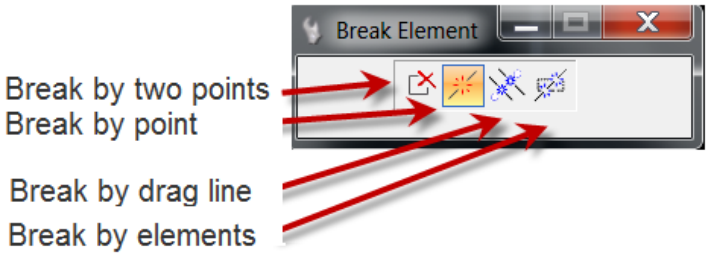
1. Select the Modify Element tool.
2. Identify the element to modify.
3. Enter data point to make modification.
4. Reset to finish

Key-in: Modify Element

Modify Examples



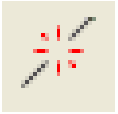
Break Element



Break by two points
Users can partial delete an element by:

1. Select the Delete Part of Element tool.
2. Identify the element at one end of the part to delete.
3. Enter data point to define end of open element or enter data for direction for closed element.
4. Enter data point to define end of closed element

Break by point (Break Element)



Users can break an Element by:

1. It is used to break a linear element at a defined point. It won't remove any of that element just separate it into new elements.

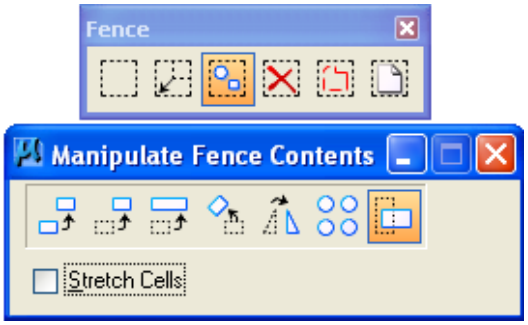
Break by Drag Line Drag a point to break elements (select 1st and 2nd point)

Break by elements Identify the cutting element and then the element to cut

Fence Stretch

Manipulate Fence Contents.

Users can manipulate Fence Contents by:

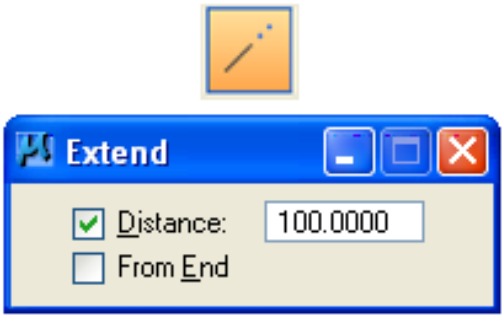


1. Select the Manipulate Fence Contents tool.
2. Set operation the Stretch.
3. Place fence overlapping elements to stretch or shorten (works like overlap fence mode).
4. Enter data point inside the fence to define the origin.
5. Enter data point to reposition the fence and the affected vertices

Key-in: Fence Stretch

Extend Line

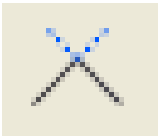
Users can extend a line by:



1. Select Extend Line tool.
2. Identify the line near the endpoint to modify.
3. If Distance is on, accept; if not, data point to define length. (Use a negative Distance to shorten).

Key-in: Extend Line

Trim to intersection Trim Two Elements to Intersection



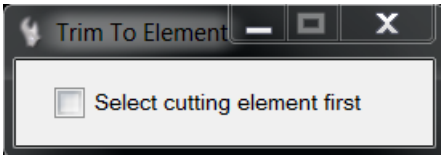
Users can extend two elements to an intersection by:

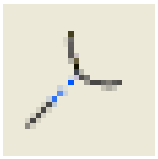
1. Select Trim to Intersection Tool.
2. Identify the elements to intersect and accept.

Key-in: Extend Element

Trim to element

Users can extend an element to an intersection by:



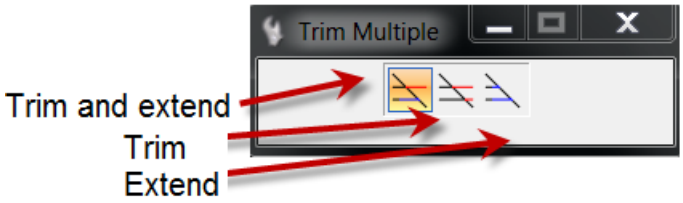


1. Select Trim to Element tool.
2. Identify the element to extend or shorten.
3. Identify the element and to extend or shorten to accept it.

Option to inverse selection order

Key-in: Extend Element Intersection

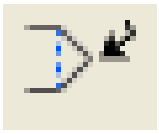
Trim Element



Users can trim an element by:

1. Select Trim Element tool.
2. Identify the cutting element.
3. Identify an element to trim (The element is highlighted and how it will be trimmed is dynamically displayed).
4. Data to accept the trimmed element.
5. Identify another element to trim or reset to finish.
   Key-in: Trim Element

Insert Vertex



Users can insert a vertex on an element by:

1. Select the Insert Vertex tool.
2. Identify the segment on which to add vertex.
3. Enter data point to position the new vertex.

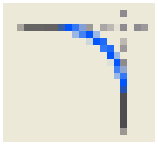
Key-in: Insert Vertex

Delete Vertex

Users can delete a  vertex on an element by:

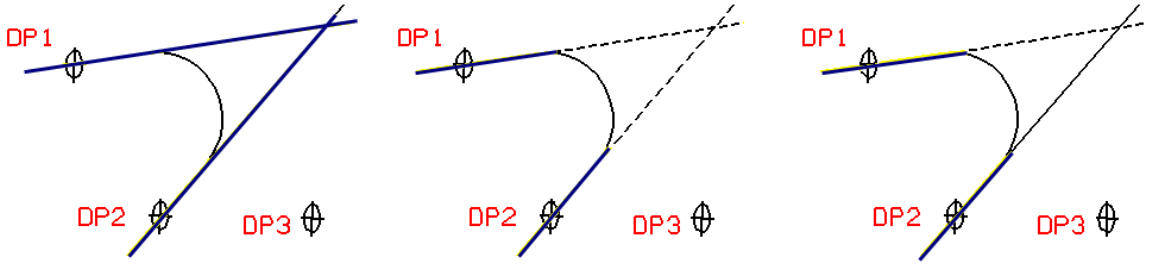
1. Select the Delete Vertex tool.
2. Identify the vertex or extension line.
3. Accept the deletion

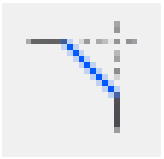
Key-in: Delete Vertex

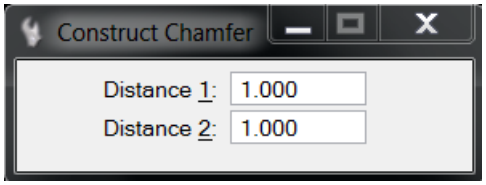
Fillet Sub-Palette *Construct Circular Fillet* tool 

Fillet

1) Select the *Construct Circular Fillet* tool.
2) Identify the first element or segment.
3) Identify the second segment.
4) Accept the fillet.



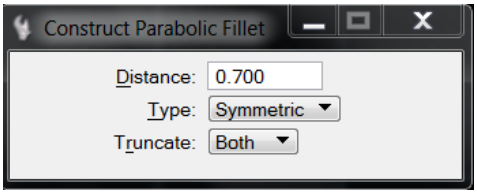
Construct Chamfer 



1) Select the *Construct Chamfer* tool
2) Identify the first line or segment
3) Identify the second line or segment
4) Data point to accept the chamfer

Key-in: **Chamfer**

Construct Parabolic Fillet: Used to construct a parabolic fillet (curve element) between two lines 

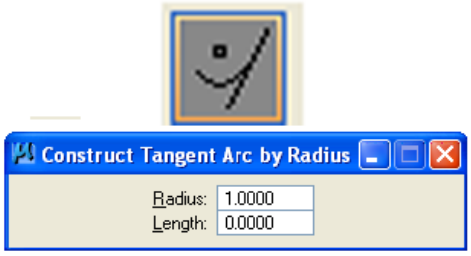


CHAPTER 4

MicroStation 5 Sub-palette (In MDT Custom Palette)

To open the menu, go under the MDT pull down menu, select MDT CUSTOM then select MICRO 5.

Construct Tangent Arc by Radius



1. Select Construct Tangent Arc by Radius Tool.
2. Fill in desired Radius and Length.
3. Identify line to construct arc on.
4. Move to the side of line to construct arc on.
5. Data Point to accept arc.

Key-in: Construct Tangent Arc 1

Construct Arc Tangent to Three Elements

1. Select Construct Arc Tangent to 3 Elements tool.
2. Identify the three elements.
3. Data Point to accept and show direction of arc.

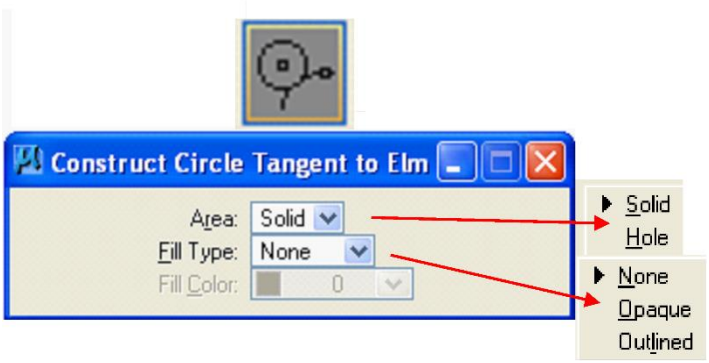
Key-in: Construct Tangent Arc 3

Construct Line Bisector

1. Select Construct Line Bisector Tool.
2. Identify line to bisect.
3. Data point to define length.

Key-in: Construct Bisector Line

Construct Circle Tangent to Element



1. Select Construct Circle Tangent to Element tool.
2. Identify element.
3. Data Point to define center of circle.

Area

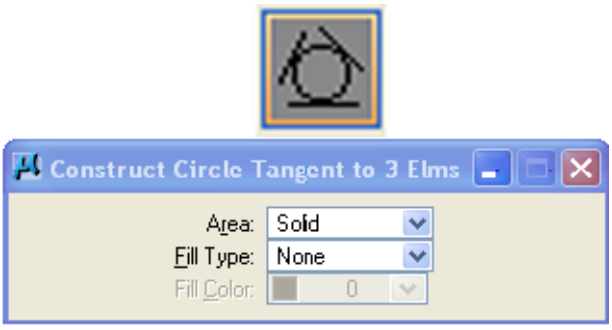
1. Solid - allows a shape to be filled or patterned.
2. Hole - does not allow a shape to be filled or patterned.
3. Fill Type. (When manipulating element, select by edge).
    a. None - creates a shape with no existing fill.
    b. Opaque - fills the shape with the selected fill color.
    c. Outlined - fills the shape with the fill color and outlines the shape with the active color.

Fill Type
(When manipulating element, select by edge)

1. None - creates a shape with no existing fill.
2. Opaque - fills the shape with the selected fill color.
3. Outlined - fills the shape with the fill color and outlines the shape with the active color.

Key-in: Construct Tangent Circle 1

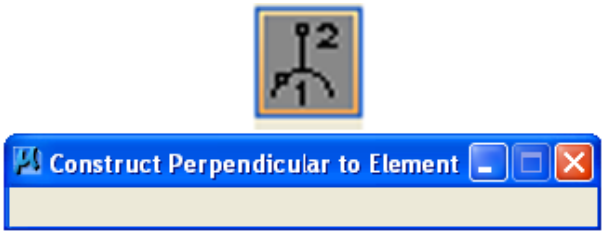
Construct Circle Tangent to Three Elements



1. Select Construct Circle Tangent to 3 Elements tool.
2. Identify the three elements.
3. Data Point to accept.

Key-in: Construct Tangent Circle 3

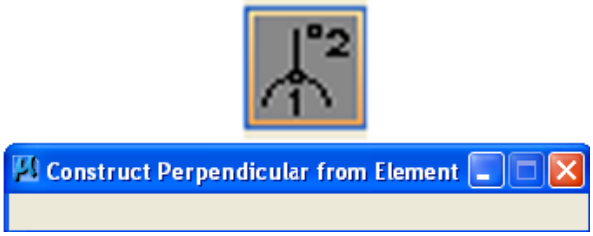
Construct Perpendicular to Element



1. Select Construct Perpendicular to Element tool.
2. Identify element at point of intersection.
3. Data Point to define length.

Key-in: Construct Perpendicular To

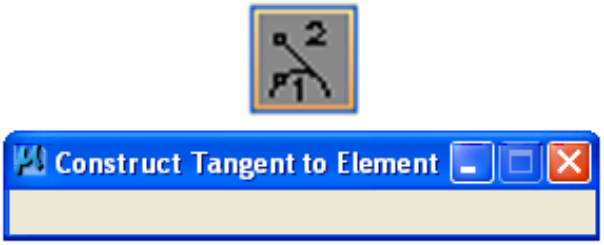
Construct Perpendicular from Element



1. Select Construct.
2. Perpendicular from Element tool.
3. Identify element.
4. Data Point to define point of intersection and length.

Key-in: Construct Perpendicular From

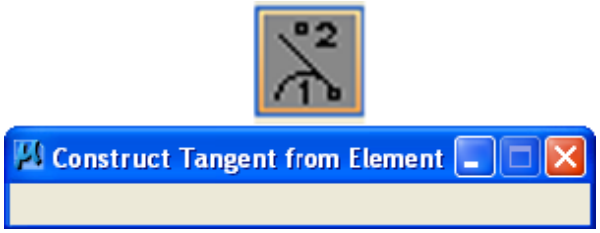
Construct Tangent to Element



1. Select Construct Tangent to Element tool.
2. Identify element.
3. Data Point to define length and direction.

Key-in: Construct Tangent to Element

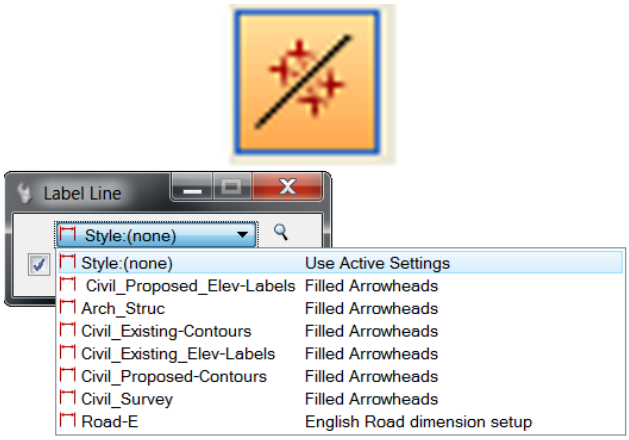
Construct Tangent from Element



1. Select Construct Tangent from Element tool.
2. Identify element at point of intersection.
3. Data Point to define length.

Key-in: Construct Tangent From

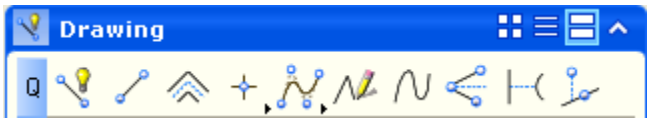
Label Line



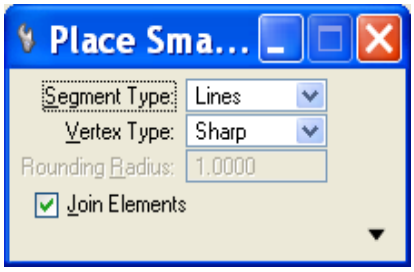
1. Select Label Line tool.
2. Identify element.
3. Data Point to accept.

NOTE: For labeling Bearing with DDMMSS
Settings > Design file > Angel readout > **Azimuth** or **Bearing** choice

Linear Elements Sub Palette



Place SmartLine

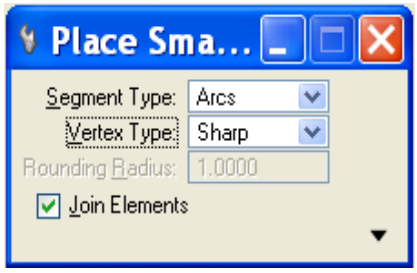


Select Place SmartLine Tool.

1. Select the Segment Type.

a. Line - to create line segments.

b. Arc - to create arc segments.

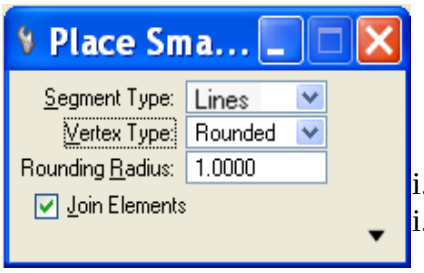


2. Select the Vertex Type.

a. Sharp - no rounding or chamfering.

b. Rounded - Rounds vertex by radius specified.

c. Chamfered - Chamfers vertex by offset specified.



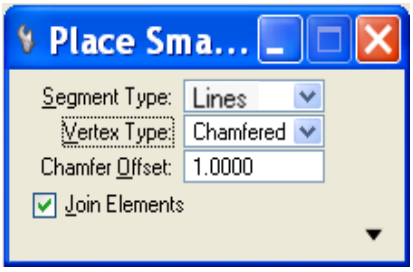
3. Toggle Join Elements on/off.

a. On - The segments will create a closed chain upon snapping to the first vertex point.

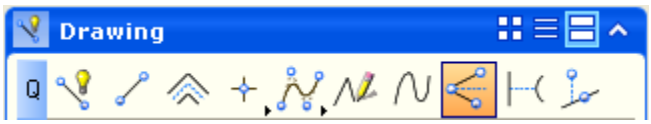
i. Toggle Closed Element on/off.

i. On - Select Area Type, Fill Type and color.

b. Off - The segments will remain separate elements that may have different symbology.



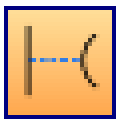
Construct Angle Bisector



1. Select Construct Angle Bisector tool.
2. Identify one endpoint of the angle.
3. Identify the vertex of the angle.
4. Identify the second endpoint.

Key-in: Construct Bisector Angle

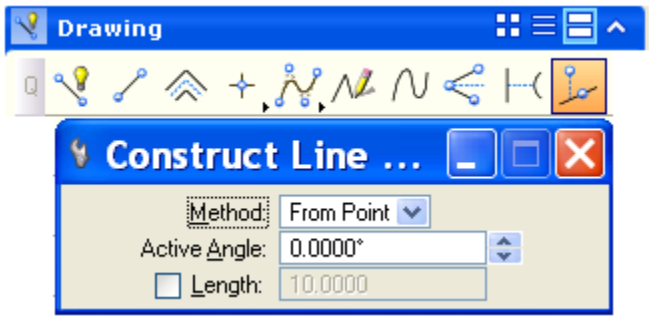
Construct Minimum Distance Line



1. Select Construct Minimum Distance Line tool.
2. Identify the elements to draw between and accept.

Key-in: Construct Line Minimum

Construct Line at Active Angle



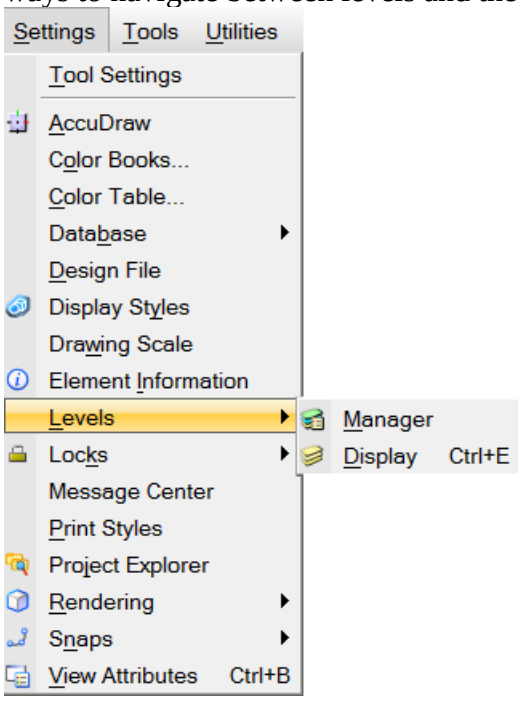
1. Select Construct Line at Active Angle tool.
2. Identify the element to intersect.
    a. If the Method is From Point, this data point defines the intersection point.
3. Enter a data point.
    a. If the Length is off, this data point defines the length.
    b. If the Method is To Point, this data point defines the intersection.

Key-in: Construct Line AA

Levels

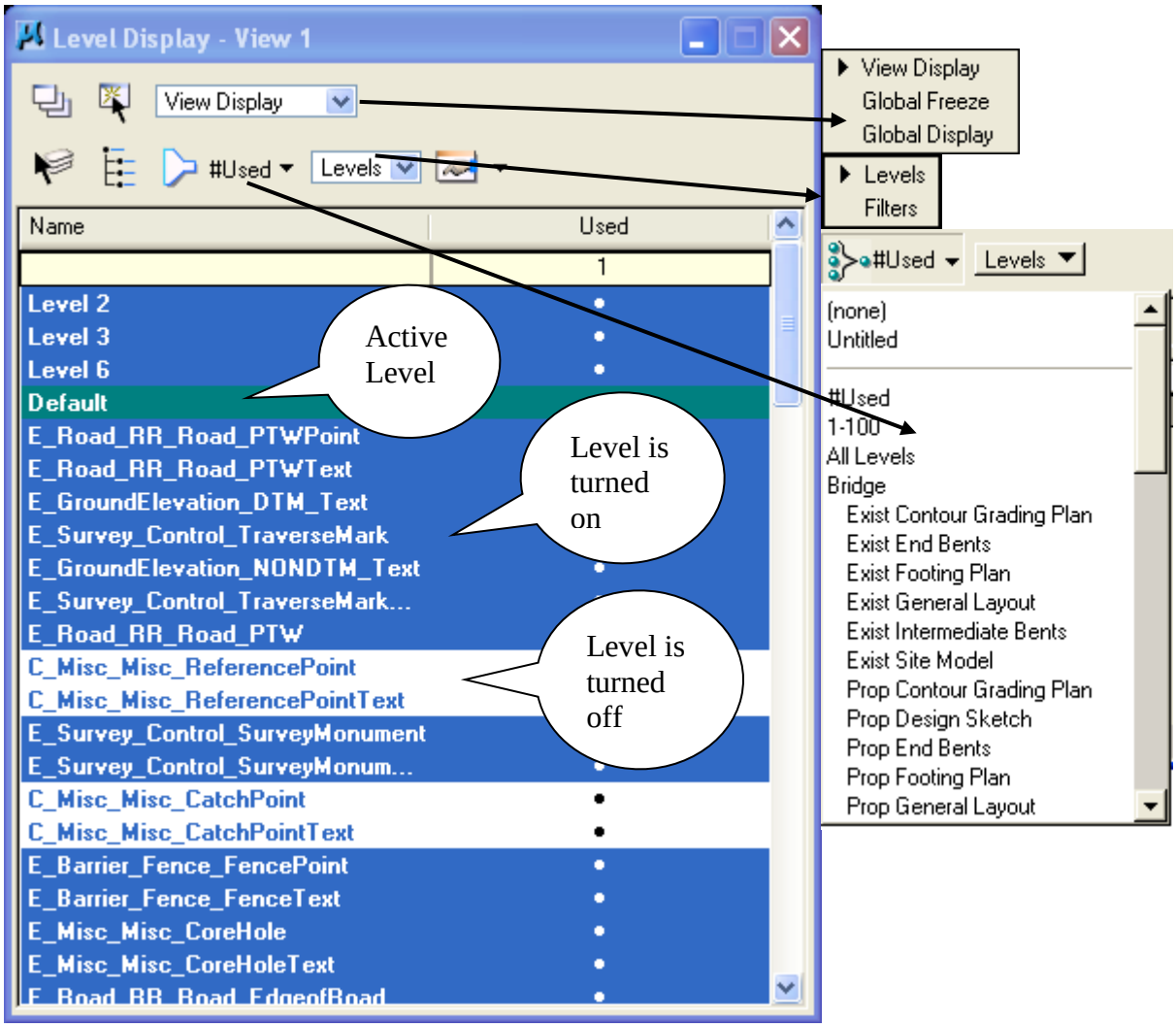
View Levels

When working at MDT it is important to remember that every time you place a different type of element, that element type will have its own level. Fences, culverts, lines on the road, wetlands, utility lines, and even cattle guards have their own levels. There are many ways to navigate between levels and the options within levels.



The easiest way to navigate is probably using the Level Display. To open the Level Display Dialog Window, simply **click on the Level Display button in the Primary Tool bar, or open the Settings menu, highlight "Level" until the drop-down menu opens and select "Display."** You can also type "Ctrl E" on the key board. All three will open the Level Display.

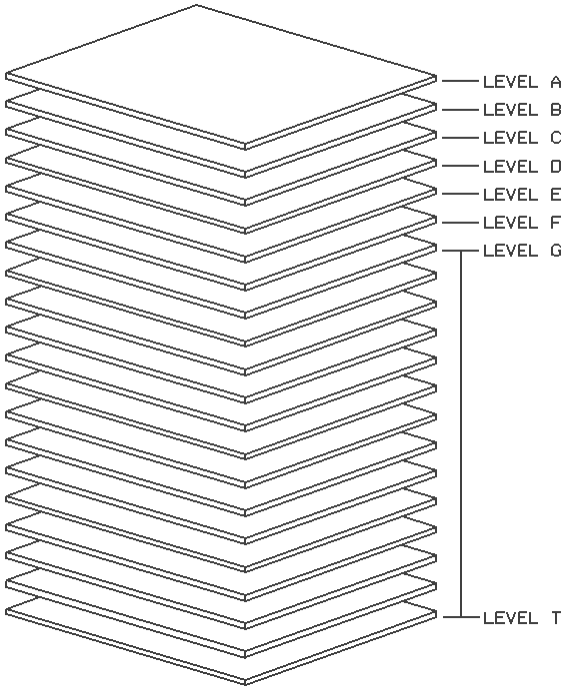
There are several features of the Level Display Dialog Window that are quite helpful. One of the most helpful features is probably the Levels/Filters option menu. On the Levels setting you can see a list of all the possible levels, complete with information such as the level name, level number, seed file type, use status, and more. You can also see which level the active level is (the one currently in use as opposed to any level that has been used in the design file), as it is highlighted in **green**. The **Blue** highlights indicate level is turned on. The **White** highlight indicate levels turned off. The **Green** highlight indicates that the level is the active level.
The Filters setting are filters used by individual sections such as Road Design or Photogrammetry. These filters have only specific levels associated with specific sections.
The view toggles in the dialog window are another useful feature that allows you to apply different levels to each view and makes it possible to look at several different options at once. The view toggles are in the View Display drop down menu. The drop-down menu should be left on its default setting when working on design files; the Global Freeze and Global Display options are not used at MDT.



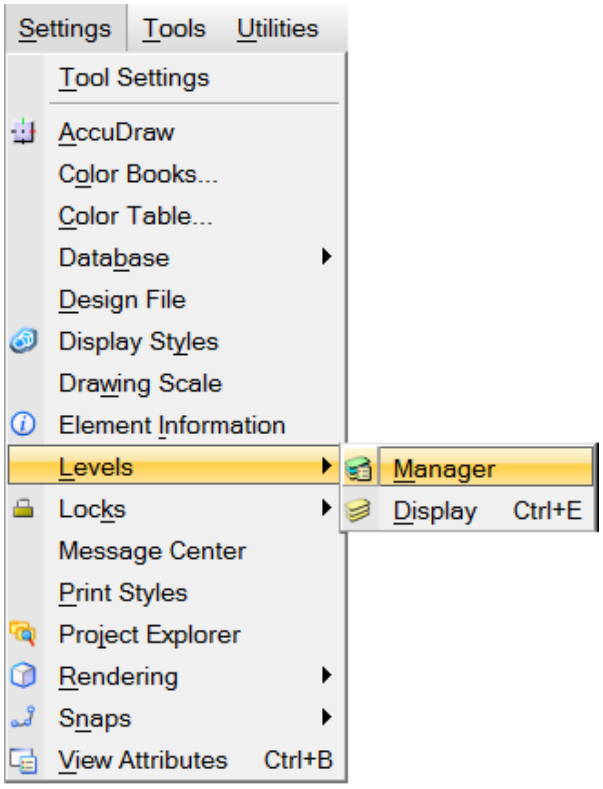
Single Click - Turns levels off & on. Double Click - Changes active level.
To turn "On" & "Off" multiple levels at onetime - Hold down the data button on the mouse and pull down or up across levels.

Standard Levels

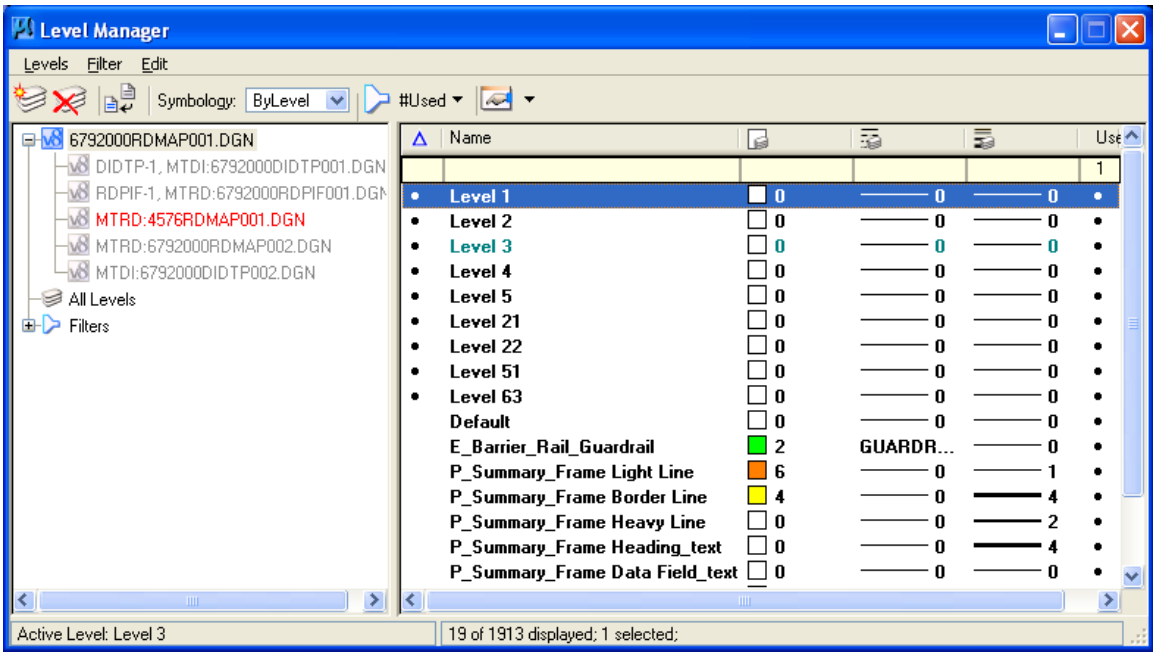
Each area has set up standard levels for different sections of designs. Check the design manual for your area.



Level Manager



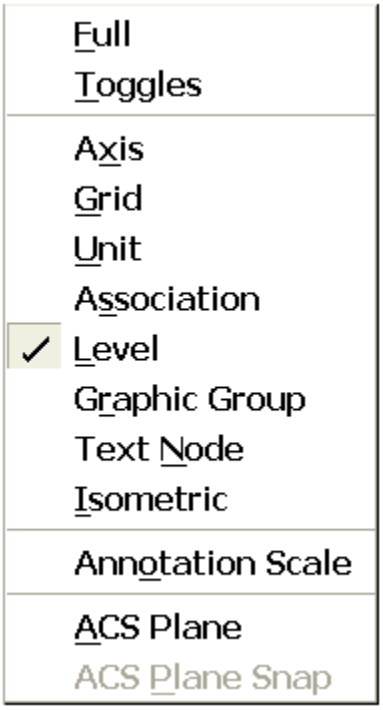
Using the Level Manager is another way to navigate through the level tools. It does essentially all the same things that Level Display does in a slightly different format. You can open the Level Manager by clicking the Settings menu, highlight "Level" until the drop-down menu opens. When the drop-down menu opens, choose "Manager." A second way is to click on the Level Display button in the Primary Tool bar



Key-ins:

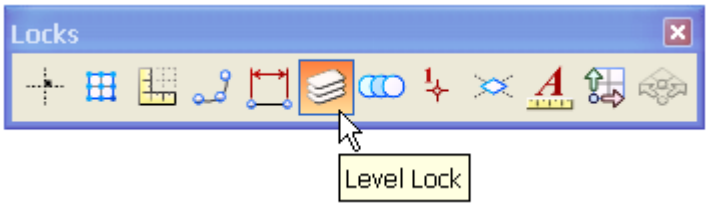
1. Lv = Active Level (i.e. lv=225 or name)
2. On = Turns on Levels (i.e. on=1-10 or name)
3. Of = Turns off Levels (i.e. of=10-20 or name)

Setting Locks Sub-menu



1. Toggle On/off (Default Off).
2. Fence manipulations affect all levels on.
3. Element manipulations affect only Active Level.

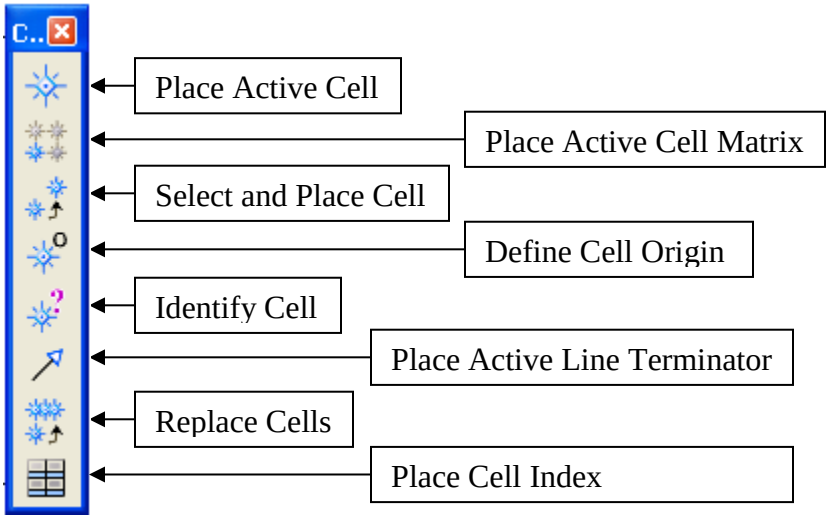
Key-in: Lock Level On/Off



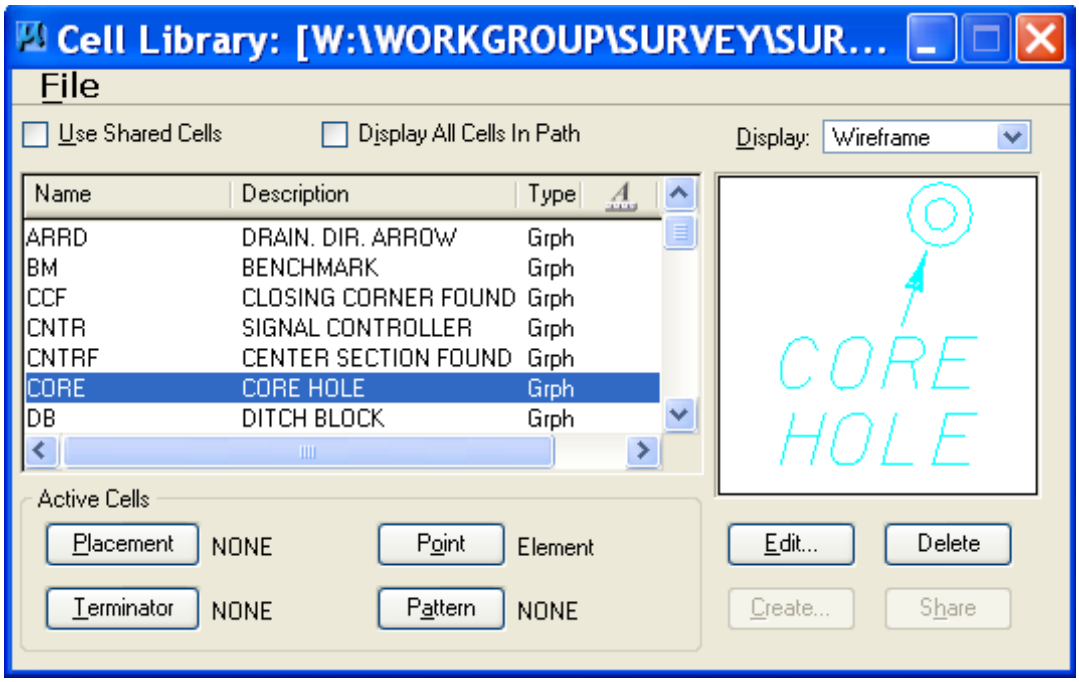
CHAPTER 5

CELLS

Cells Sub-palette

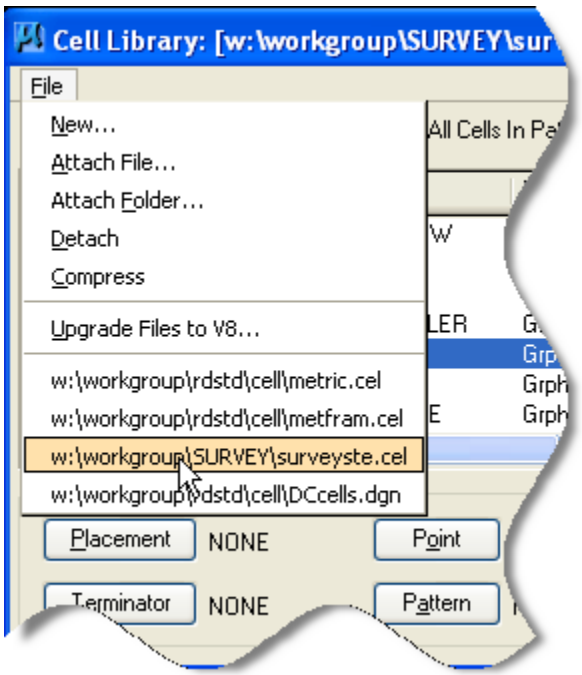


To open the Cell Library menu, go to **Element** > **Cells**



Cell Library File pull down menu.

1. Attach Existing Cell Library. This menu is used to attach existing cell libraries. Usually will attach from CADD Standards drive (W:drive). However, one can attach from any drive currently available on the PC.
2. Create New Cell Library. Used to create new cell libraries. This cannot be created on CADD Standards drive (W: drive).
3. Compress - Compress Cell Library. Used to save changes to cell library.



Explanation of Cell Types and Their Properties

Graphic and Point Cells

1. Cc=Name (<=6 Char, no spaces), Description (<=27 Char), Type [P or Blank (Defaults to G)].
2. *Active Settings (Angle (AA), Scale (As), Line Code (Lc), Color (Co) and Weight (Wt) Affects Cell Upon Creation.

Graphic Cells

1. Placement Can Be Relative (Placed on Active Level) or Absolute (Placed on Level Cell Was Created On).
2. Active Angle and Active Scale Affects Cell Upon Placement.
3. Always Placed by Origin.
4. Can Snap to Individual Elements in the Cell.

Point Cells

1. Placement Always Relative (Always Placed on Active Level).
2. Active Line Code, Color and Weight Affects Cell Upon Placement.
3. Can Only Snap to Cell Origin.

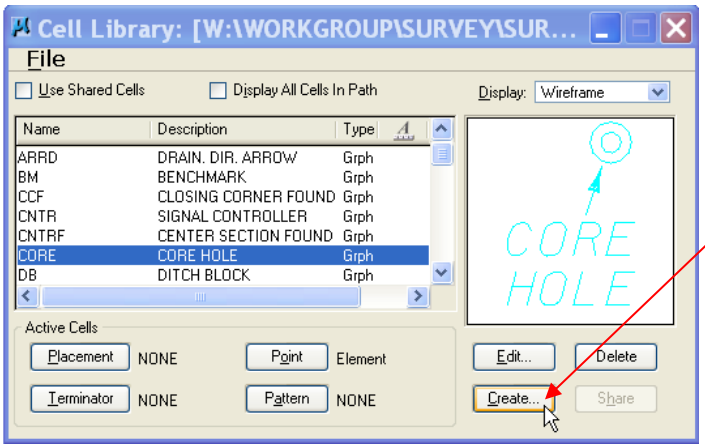
Procedure for Creating a Cell

1. Draw Element(s).
2. Place Fence (Inside or Overlap Lock) Around Element(s) or use Element Select tool.
3. Select Define Cell Origin Tool from Cell Library menu.
4. Enter data point to define cell origin.
5. Reset to accept cell origin.

What is a Cell Origin? Each cell has a cell origin, defined at the time of the creation of the cell. This point of origin is the "handle" of the cell. By entering a data point to place the cell, the origin is placed at that point. We refer to this point as the point of insertion.

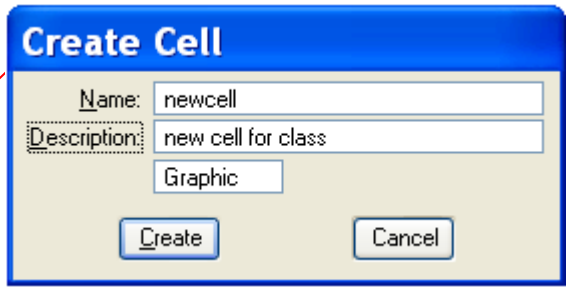
Key-in: Define Cell Origin

Create Cell



Click on the Create... command button.

(Create New Cell Input Box Is Displayed).

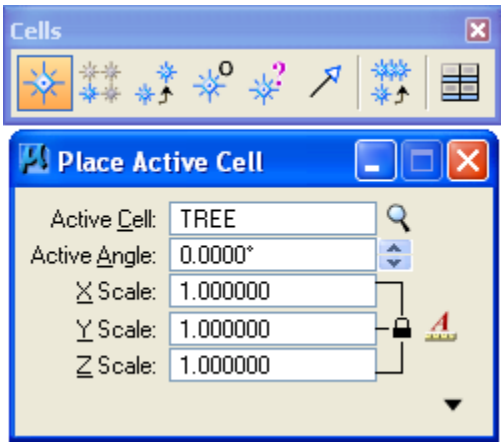


Create New Cell Input Box

1. Enter name (no spaces) in Name: Field.
2. Enter description in Description: Field.
3. Select cell type (Graphic or Point (see page 5-2 for definitions)) from cell type drop down menu list (Default is Graphic).
4. Click on Create button to create cell. The new cell is placed in the cell library.

Key-in: Cc=Name, Description, Type
(Eg.: AC=House, origin Lower Left Corner@)

Cell Tool Box Main



Place Active Cell

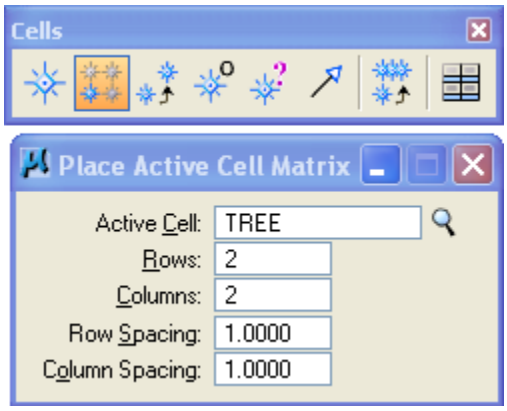
Note:
Cell selected for placement in [Settings Cells Sub-menu] (shown at left) will automatically be displayed in Active Cell field of Place Active Cell or Place Active Cell Matrix tool settings.

To place an active cell.

1. Select Place Active Cell tool.
2. Fill in appropriate information, if necessary. (Active Cell name, Active Angle, X Scale, and Y Scale).
3. Toggle Interactive On to Place Active Cell at other than Active Scale or Active Angle (enter two data points to define scale and rotation angle).
4. Toggle Relative On to Place Graphic Cell on Active Level.
5. Enter data point to position cell origin.
6. Reset to finish.

Key-in: Place Cell Icon

Place Active Cell Matrix

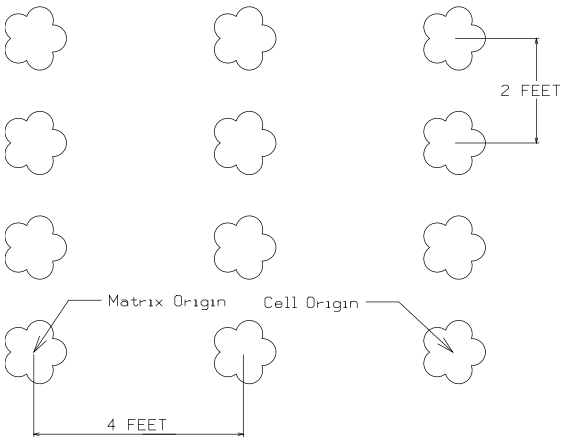


1. Select Place Active Cell Matrix tool.
2. Fill in appropriate information: (Active Cell name, Number of Rows, Number of Columns, Row Spacing, and Column Spacing).
3. Enter data point to position cell matrix.

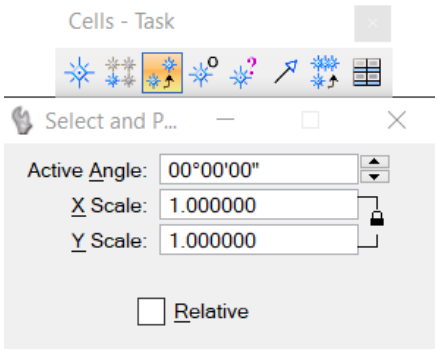
Key-in: Matrix Cell

Example Matrix Cell

This cell matrix was made with 4 rows 3 columns 2 feet between rows and 4 feet between columns.



1. Select cell as active cell.
2. Set cell matrix rows and column information using Matrix Cell key-in.
3. Place a data point to indicate the origin of the lower left cell (matrix origin).

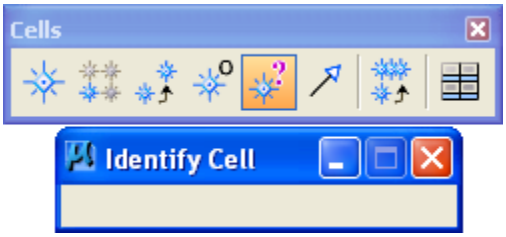


Select and Place Cell

1. Select the Select and Place Cell tool.
2. Data to identify an existing cell in the design file.
3. Fill in appropriate information:(Active Angle, X Scale, and Y Scale).
4. Enter data point to position the copy of the cell.
5. Reset to finish.

Key-in: Select Cell Icon

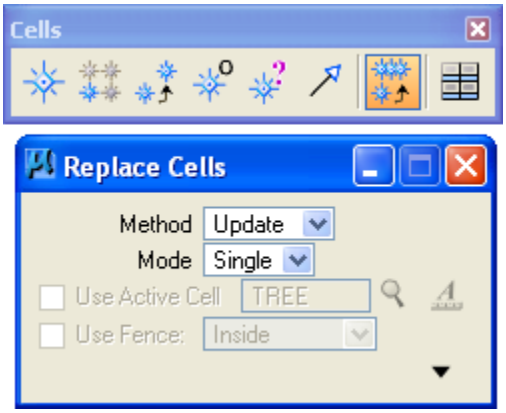
Identify Cell



1. Select Identify Cell tool.
2. Data to identify cell.
3. Data to accept the cell. (Cell name and level are displayed in the Command Window).

Key-in: Identify Cell

Replace Cell



1. Place “dummy” cell in design file.
2. DROP status on “dummy” cell.
3. Make changes to the elements.
4. Either rename cell in cell library (if you want to keep the original) or you can delete the cell from the library.
5. Create a cell out of dummy copy with SAME NAME and ORIGIN POINT as old cell.
6. Select Replace Cell tool.
7. Data to identify cell.
8. Data to accept the replacement.

Note: If the identified cell is shared, all instances of the cell in the design are replaced. If the identified cell is unshared, only the identified cell is replaced.

Key-in: Replace Cell

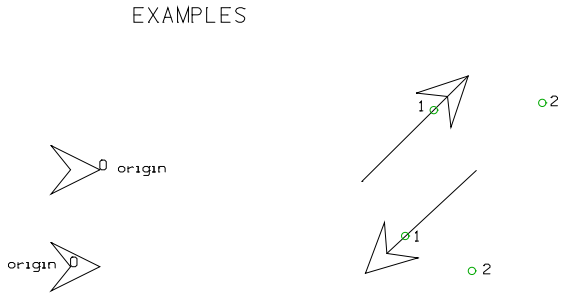
Place Line Terminator

1. Select Place Active Line Terminator tool.
2. Enter terminator cell name and scale.
3. Identify element near endpoint where terminator is to be placed.
4. Data to accept line terminator.

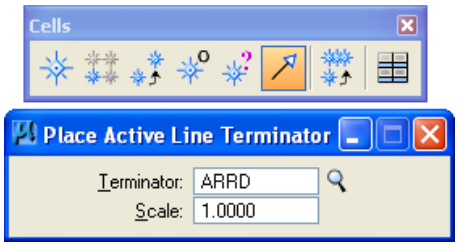
Note:
Cell selected as terminator in [Settings Cells Sub-menu] will automatically be displayed in Terminator field of Place Active Line Terminator tool settings.

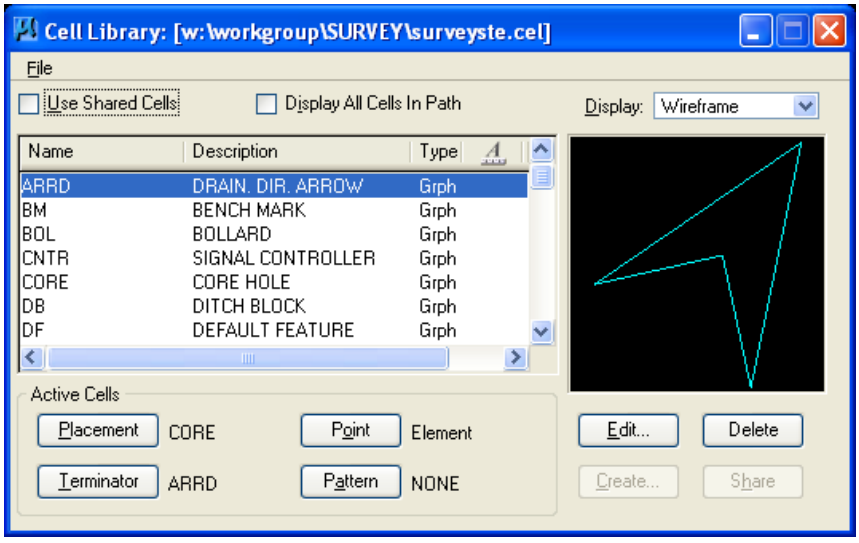
Key-in: Place Terminator

Examples Of Line Terminators



These line terminators were made using the place line terminator palette to place arrow cells with different origins at different termination points.

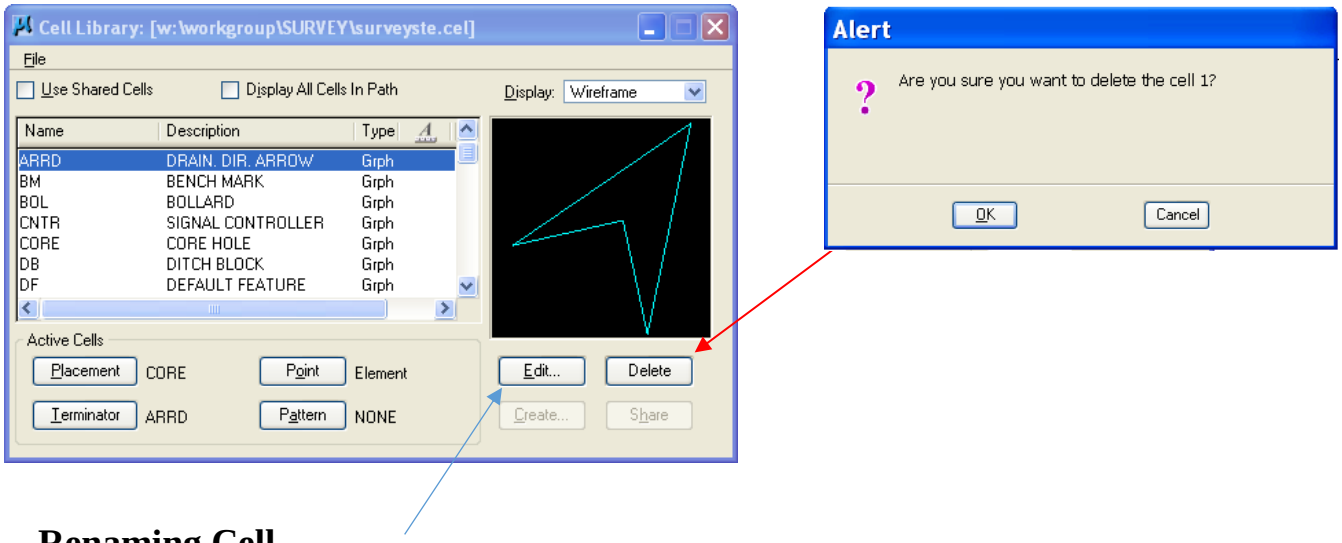




Deleting a Cell

1. Select the Cell to be deleted from the Cell Name listing in the [Element > Cells].
2. Select Delete Cell Command From [Element > Cells]. (Causes Alert Input Box to Be Displayed).
3. Click on the OK button to Delete the Cell. (Deletes Cell from Library).
4. Click on the Cancel button to Cancel Deletion.

Key-in: Cd=delete Cell



Renaming Cell

1. Select the Cell to be renamed from the Cell Name listing.
2. Select Edit Cell Command From.

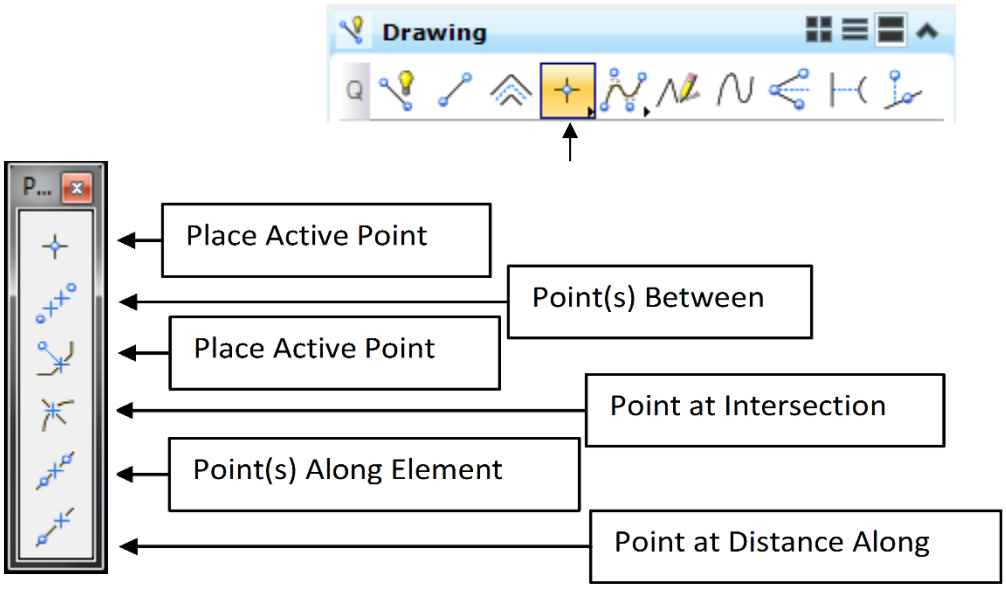
Edit Cell

Edit Cell Information Input Box

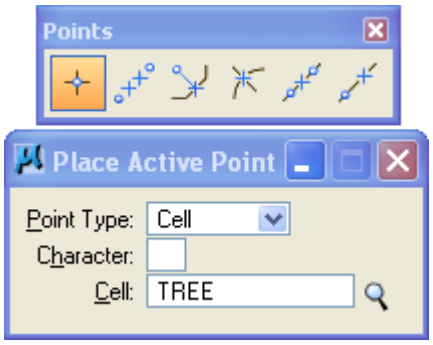
1. Click on the Edit... command button. (Edit Cell Information Input Box Is Displayed).
2. Edit Cell Information Input Box.
3. Enter New name (no spaces) in Name: Field if applicable.
4. Enter New description in Description: Field if applicable.
5. Click on Modify button to modify cell information.

Key-in: Cr=Oldname, Newname

POINTS PALETTE



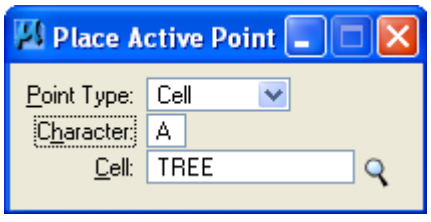
Points Tool Box Main



General Points Sub-Palette Fields:

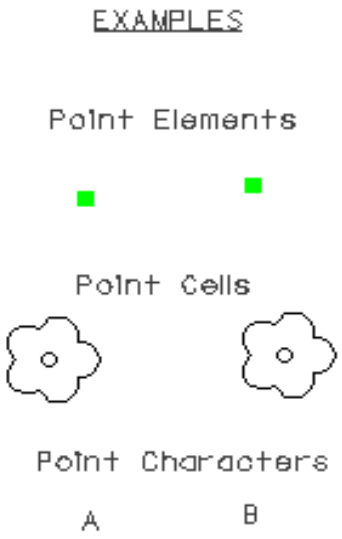
Point Type: Element places point element. Character places single character. Cell places cell.
Character: Single Character to be placed (Used with Character Point Type).
Cell: Name of Cell to be placed (Used with Cell Point Type).

Place Active Point



1. Select Active Point tool.
2. Select Point Type and enter Character or Cell information if applicable.
3. Enter data point to position Active Point.
4. Reset to finish.

Key-in: Place Point

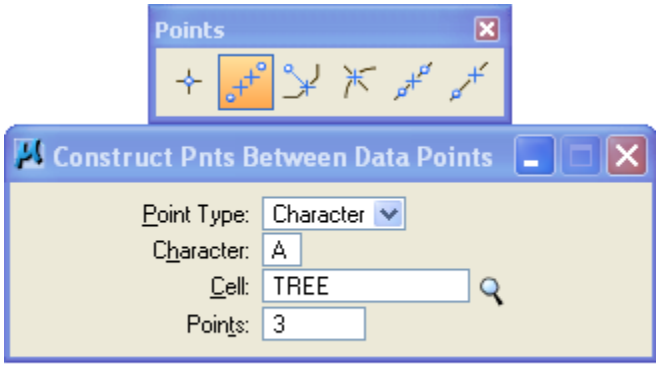


Examples Of Active Point Placement

These active points were placed using the **Place Active Point** palette to place point elements, point cells (trees) and point characters (A and B) at different active points.

Note: Point elements do not plot. However, cells and characters do plot.

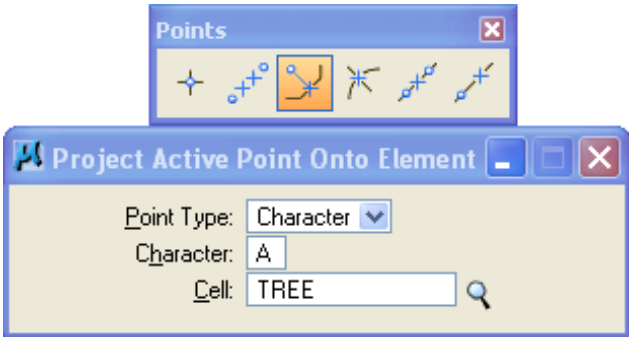
Construct Active Point Between Data Points



1. Select Construct Active Point Between Data Points tool.
2. Select Point Type and enter Character or Cell information if applicable.
3. Determine number of points. (Enter number of points to construct in Points: field).
4. Data point to define first Active point.
5. Second data point to define last active point.
6. Reset to finish.

Key-in: Construct Point Between

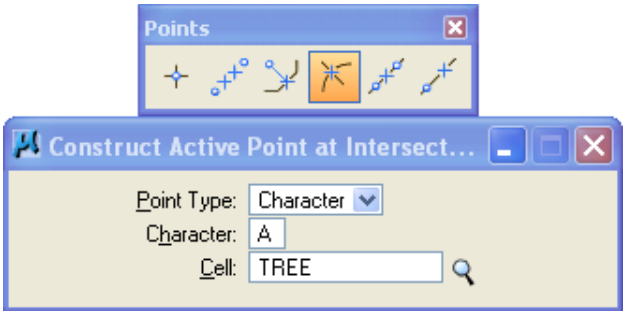
Project Active Point onto Element



1. Select Project Active Point onto Element tool.
2. Select Point Type and enter Character or Cell information if applicable.
3. Identify element.
4. Data point to project the Active Point.

Key-in: Construct Point Project

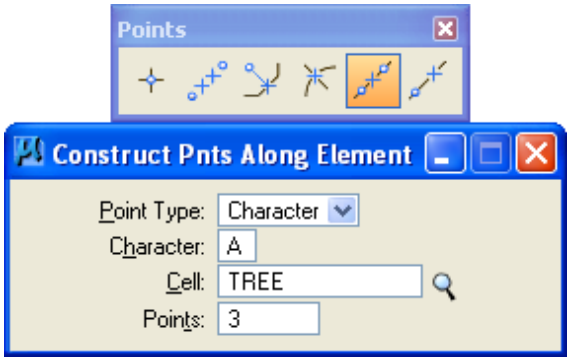
Construct Active Point at Intersection



1. Select Construct Active Point at Intersection tool.
2. Select Point Type and enter Character or Cell information if applicable.
3. Identify first element close to desired intersection.
4. Data to accept the construction.

Key-in: Construct Point Intersection

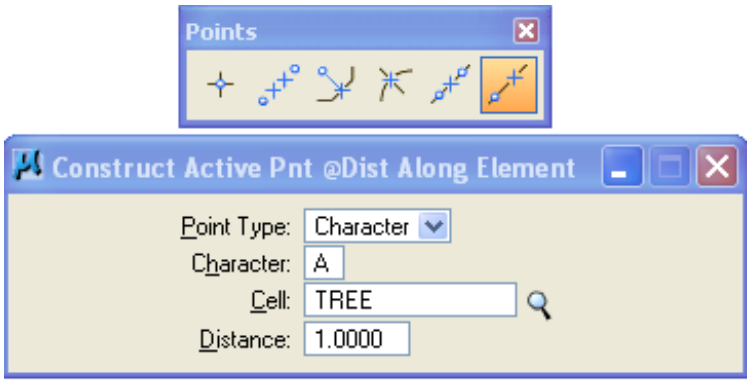
Construct Active Points Along Element



1. Select Construct Active Point Along Element tool.
2. Select Point Type and enter Character or Cell information if applicable.
3. Determine number of points.
4. Identify element to define one end of segment on which to construct Active Point.
5. Data point to define the other end of segment.

Key-in: Construct Point Along

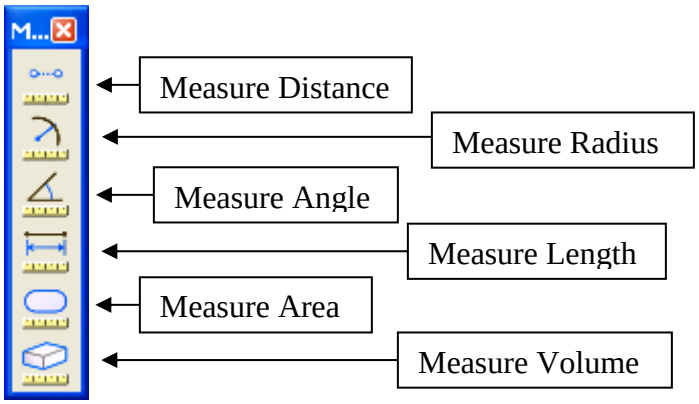
Construct Active Point at Distance Along Element



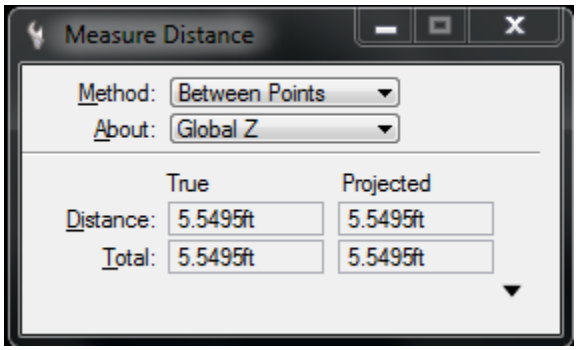
1. Select Construct Active Point at Distance Along Element tool.
2. Select Point Type and enter Character or Cell information if applicable.
3. Determine distance. (Enter distance along element to construct point in Distance: field).
4. Identify element at point to measure the distance from.
5. Data point to define direction.

Key-in: Construct Point Distance

MEASURE PALETTE



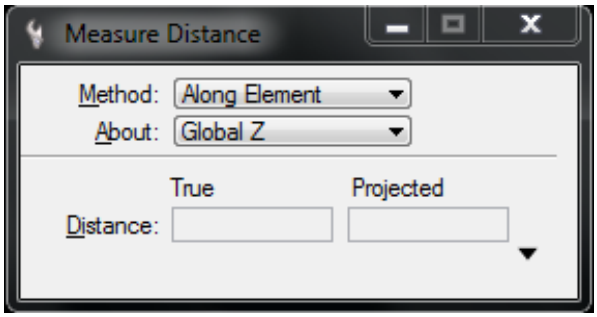
Measure Cumulative Distance from an Origin



1. Select Measure Distance tool.
2. Set Distance to Between Points.
3. Data point to define origin.
4. Second data point at point to be measured. The measurement is displayed in the command window.
5. Enter another data point(s). The cumulative distance from the origin is displayed in the command window.
6. Or reset to return to step 3.

Key-in: Measure Distance Points

Measure Distance Along Element

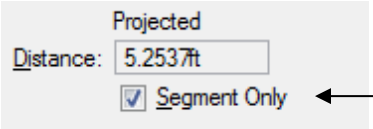


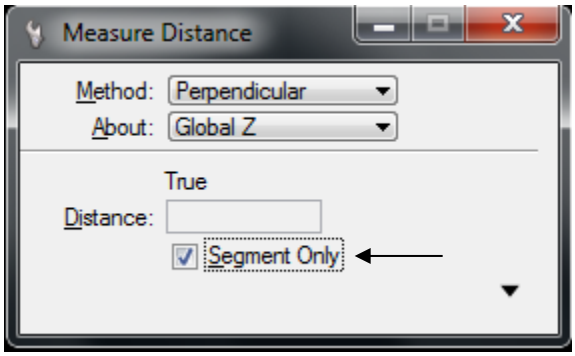
1. Select Measure Distance tool.
2. 2) Set Distance to Along Element.
3. 3) Identify element at origin.
4. 4) Data point to define point along element. The measurement is displayed in the command window.

Key-in: Measure Distance Along

Measuring with Perpendicular Snap

When measuring with the Perpendicular snap the setting ***Segment Only*** option needs to be on to snap to an element beyond the first element measured.





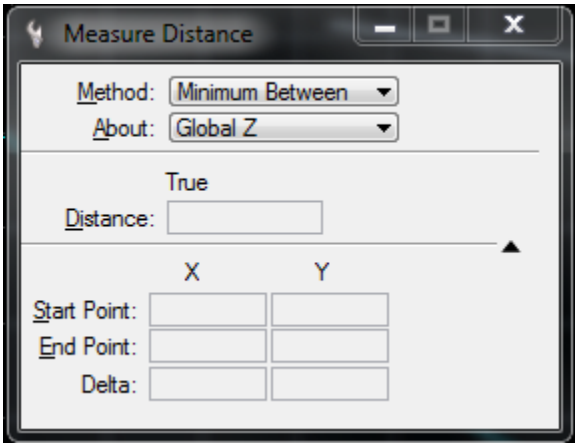
Measure Perpendicular from an Element

1. Select Measure Distance tool.
2. Set Distance to Perpendicular.
3. Identify element.
4. Data point at point to be measured.

The measurement is displayed in the command window.

5. Reset to finish.

Key-in: Measure Distance Perpendicular

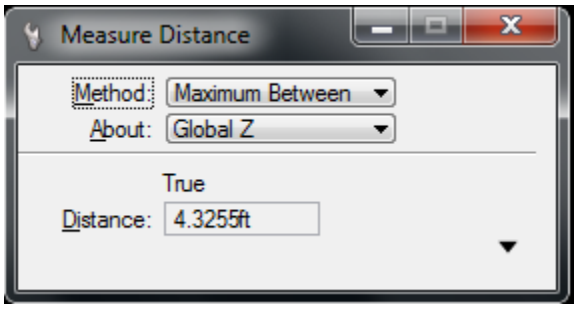


Measure Minimum Distance Between Elements

1. Select Measure Distance tool.
2. Set Distance to Minimum Between.
3. Identify first element.
4. Identify second element.
5. Data to accept the elements. The measurement is displayed in the command window.

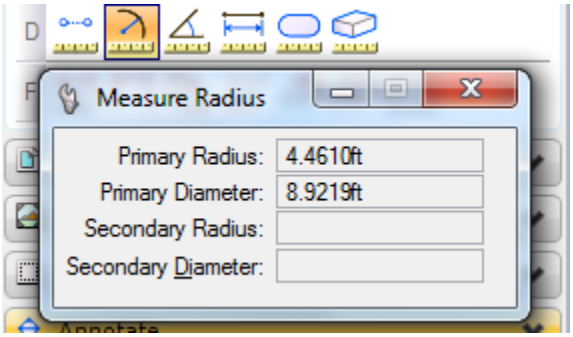
Key-in: Measure Distance Minimum

Measure Maximum Distance Between Elements



1. Select Measure Distance tool.
2. Set Distance to Minimum Between.
3. Identify first element.
4. Identify second element.
5. Data to accept the elements. The measurement is displayed in the command window.

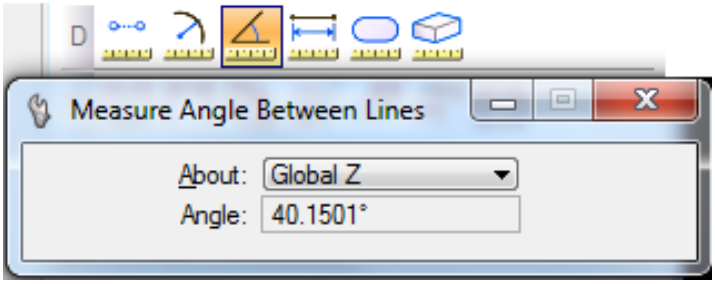
Key-in: Measure Distance Minimum



Measure Radius

1. Select Measure Radius tool.
2. Identify Element or segment.
3. Data to accept the element. The measurement is displayed in the command window.

Key-in: Measure Radius

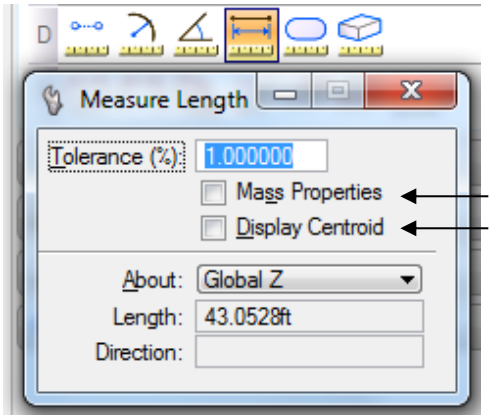


Measure Angle Between Lines

1. Select Measure Angle Between Lines tool.
2. Identify first line.
3. Identify second line.
4. Data to accept the lines. The measurement is displayed in the command window.

Key-in: Measure Angle

Measure Length

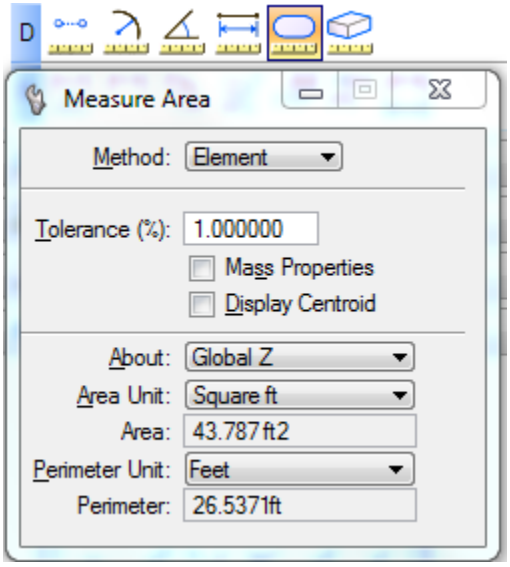


1. Select Measure Length tool. The Tolerance (%) is used when measuring curves. It represents the maximum allowable percentage of the distance between the true curve and the approximation used to measure the curve. A low tolerance makes the measurement more accurate but increases the calculation time. If Mass Properties is toggled on, the Mass Properties window displays the mass property analysis.

   Default Properties: Length, Mass, and Centroid. Properties Toggled On Under Display Menu: Moments and Properties of Inertia; Principal Moments and Directions; and Radii of Gyration. If Display Centroid is toggled on, a graphic crosshair that represents the center of mass for the measured element(s) is displayed.
2. Identify element.
3. Data to accept element. The measurement is displayed in the command window.

Key-in: Measure Length

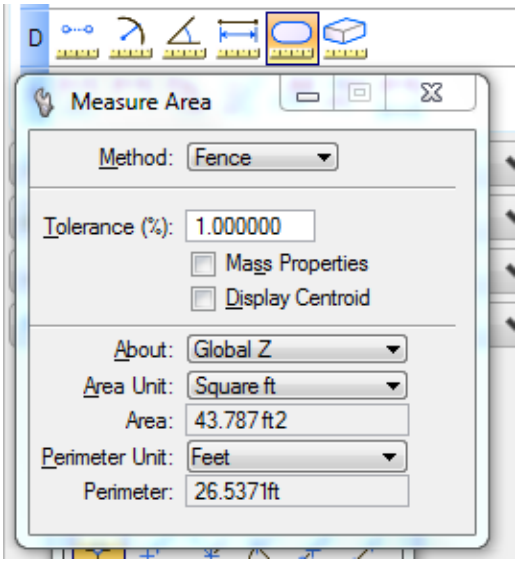
Measure Area and Perimeter of One Element



1. Select Measure Area tool. Mass Properties Same as For Length except, Default Properties. Perimeter, Surface Area, Mass, and Centroid.
2. Set Method to Element.
3. Identify element.
4. Data to accept element. The measurement is displayed in the command window).

Key-in: Measure Area Element

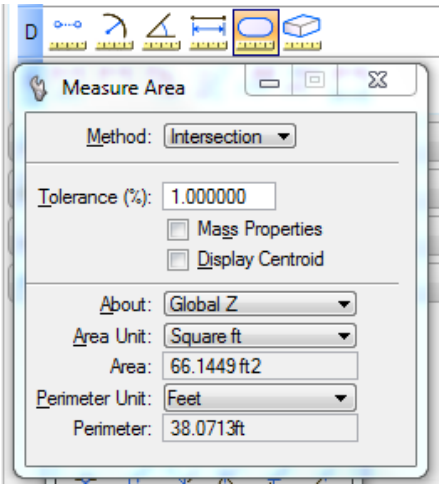
Measure Area Defined by Fence



1. Use Place Fence or Place Fence Shape tool.
2. Select Measure Area tool.
3. Set Method to Fence.
4. Data to accept the measurement. The measurement is displayed in the command window.

Key-in: Measure Area Fence

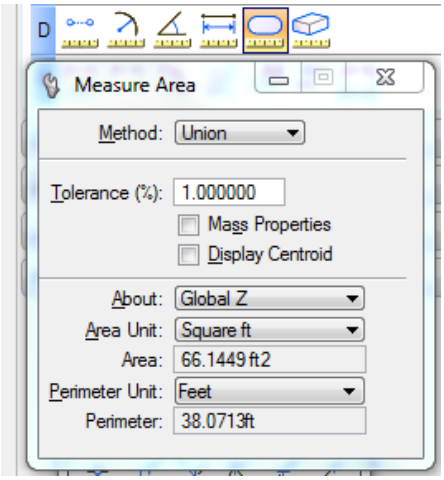
Measure Area of Intersection of Closed Elements



1. Select Measure Area tool.
2. Set Method to Intersection.
3. Identify Elements.
4. Data to accept.
5. Reset to display area in command window.

Key-in: Measure Area [Intersection]

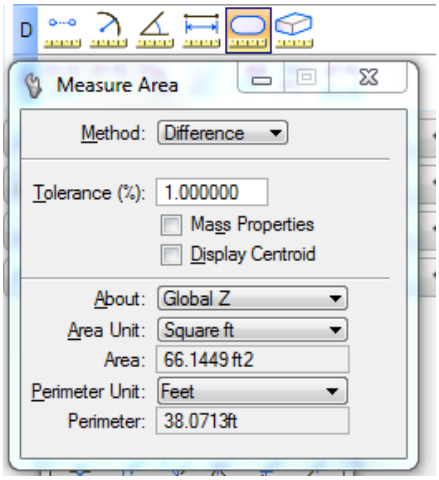
Measure Area of Union of Closed Elements



1. Select Measure Area tool.
2. Set Method to Union.
3. Identify Elements.
4. Data to accept.
5. Reset to display area in command window.

Key-in: Measure Area [Union]

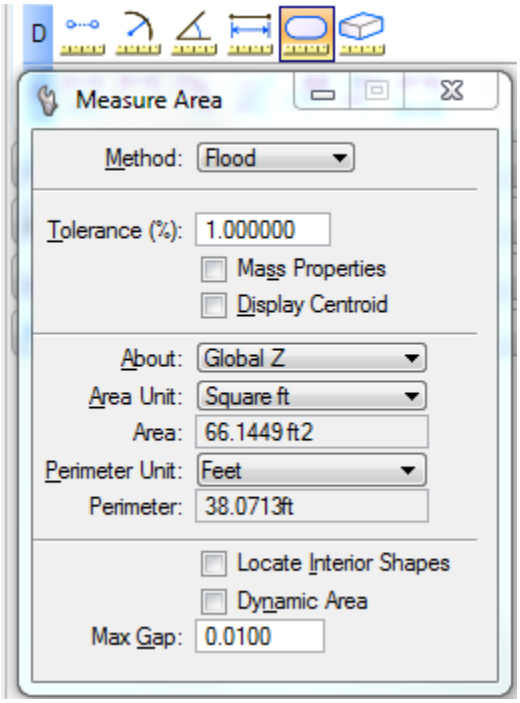
Measure Area of Difference Between Elements



1. Select Measure Area tool.
2. Set Method to Difference.
3. Identify Element from which to subtract.
4. Identify Element(s) to subtract.
5. Data to accept.
6. Reset to display area in command window.

Key-in: Measure Area Difference

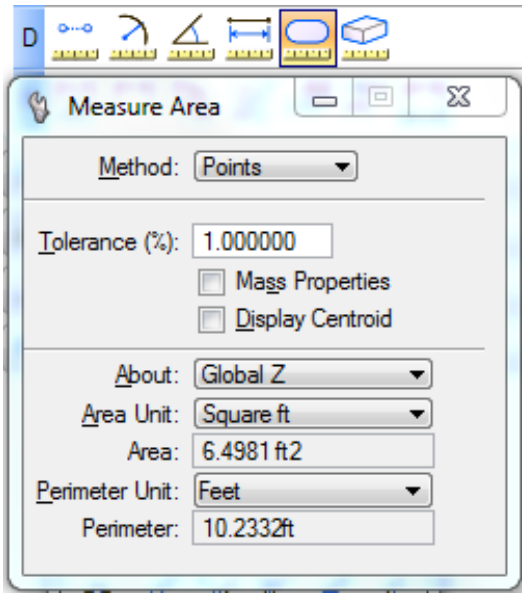
Measure Area Enclosed by Elements that Touch



NOTE: To minimize computing time, zoom in to the area of interest or select the bounding elements before selecting the command.

1. Select Measure Area tool.
2. Set Method to Flood.
3. Data point in area enclosed by the bounding elements.
4. Data to accept the measurement. The measurement is displayed in the command window.

Key-in: Measure Area Flood

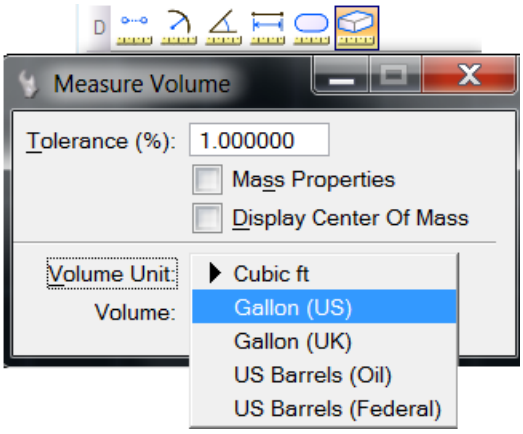


Measure Area Defined by Data Points

1. Select Measure Area tool.
2. Set Method to Points.
3. Data point to define each vertex of shape that encloses the area.
4. Reset when done. The measurement is displayed in the command window.

Key-in: Measure Area Points

Measure Volume [3D Command Only]



1. Select Measure Volume tool.
2. Mass Properties Same as For Length except, Default Properties: Perimeter, Volume, Mass, and Centroid.
3. Identify element.
4. Data to accept element. The measurement is displayed in the command window.

Key-in: Measure Volume
Volume unit options:

Various MicroStation Key-ins

View manipulation
OF= Turn off levels by number
ON= Turn on levels by number
RV= Rotate view(s) about center
WO= Set view origin
SV= Save view
VI= Attach saved view
DV= Delete saved view

Text and dimensioning
FT= Active font
DF= Opens font dialog box
TH= Active height
TW= Active width
TX= Active height and width
LL= Active line length
LS= Active line spacing
TB= Tab spacing for importing text
TI= Tag Increment amount
LD= Dimension level
TV= Upper and lower dimension tolerance limits

Settings
AA= Active angle
AS= Active scale
XS= Active x scale
YS= Active y scale
ZS= Active z scale
GU= Master/Grid
GR= Reference grid
KY= (Snap) Divisor
UR= (Unit Lock) Distance

Set element and pattern attributes
AP= Active pattern cell
LV= Active level
CO= Active color
PA= Active pattern angle
LC= Active line style
PD= Active pattern spacing
WT= Active line weight
PS= Active pattern scale

Precision input
XY= <x,y,z> from origin along design files axes
DI= <distance, direction> from last data or tentative point relative to view axes
DL= <Dx, Dy, Dz> from last data or tentative point in design coordinates
DX= <Dx, Dy, Dz> from last data or tentative point in view coordinates
AX= Distance from Auxiliary Coordinate System (ACS) origin
AD= Distance from last data or tentative point in ACS coordinates

Cells
AC= Set active cell and select place active cell tool with relative off
AR= Set active cell and select place active cell tool with relative on
CM= Place active cell matrix tool
PT= Active point
LT= Active terminator
TS= Terminator scale
CR= Edit cell information
CD= Delete cell from cell library
CC= Create cell

3D modeling
DP= Set the display depth from 0.0 of view's z-axis
DD= Distance to move display depth from current values
AZ= Set the active depth from 0.0 of the view's z-axis
DZ= Distance to move active depth from current value
SX= Save ACS
RX= Attach ACS
PX= Delete ACS

File management
RD= Open design file
XD= Open design file with active design's view configuration
RC= Attach cell library
RF= Attach reference file
DR= Displays contents of a text file
CT= Attach color table
AM= Attach and activate menu
AT= Activate tutorial

Database
AE= Define active entity
DA= Displayable attribute type
DB= Attach control file
DS= Specify fence filter
FI= Set database row as active entity
RA= Set attribute review selection criteria
RS= Name report table

Digitizing
SD= Active stream delta
ST= Active stream tolerance

User command
UC= Activate user command
UCC= Compile user command
UCI= User command index
OX= Retrieve user command index

Other
EL= Create element list file
FF= Copy fence contents to new design file
GO= Global origin
SF= Move fence contents to new design file

ABSOLUTE POINT (X, Y, Z point in the file)

FROM DEISGN FILE ORIGIN

XY= XY=1,5,-7
X Y Z

IN 3D FILE Z=Elevation

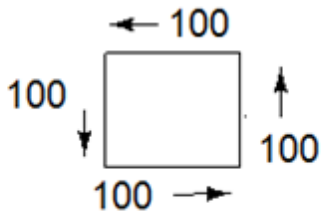
Using
Place line

1)XY=1,5 3)XY=2,6 5)=1,5
2) XY=2,5 4)XY=1,6 or DATA

POINT DELTA

DL= 1,1

FROM LAST TENTATIVE OR DATA POINT
WORKS ALONG DESIGN AXIS



Using
Place line

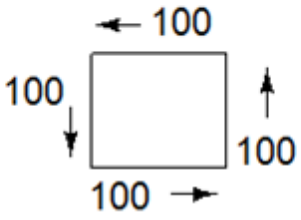
DL=100,0
DL=0,100
DL=-100,0
DL=0,-100

POINT VDELTA

DX= 1,1

FROM LAST TENTATIVE OR DATA POINT
BUT RELATIVE TO THE CURRENT VIEW

Place block lower left
corner then key in: DX=100,100



Using
Place line

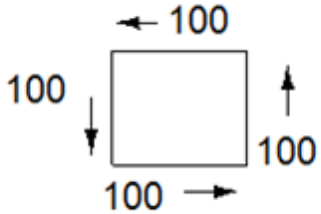
DX=100,0
DX=0,100
DX=-100,0
DX=0,-100

POINT DISTANCE

DI= DI=20,90

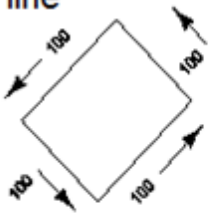
DIST.,ANGLE

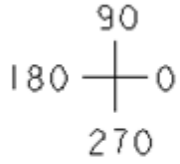
FROM LAST TENTATIVE OR DATA POINT
WORKS REALTIVE TO CURRENT VIEW



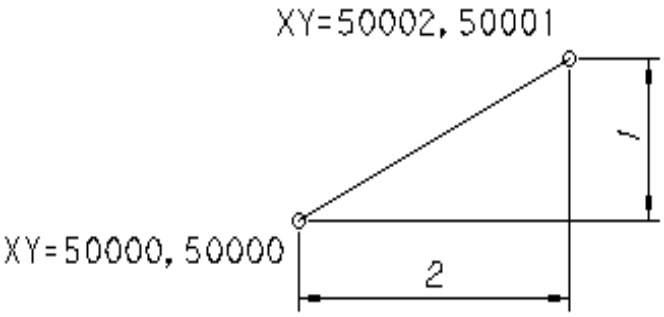
Using
Place line

DI=100,0
DI=100,90
DI=100,180
DI=100,270



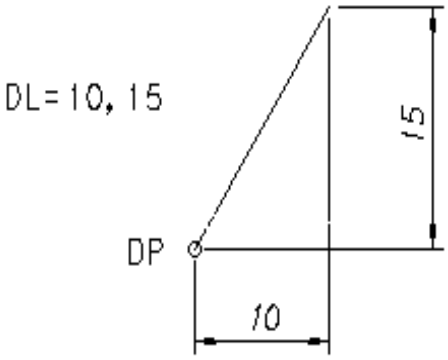


Directional Angle Compasss



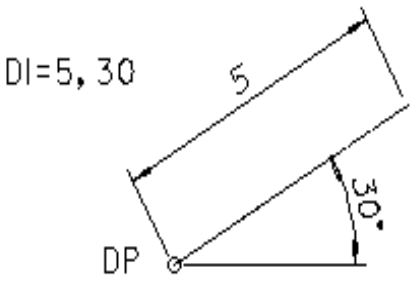
XY = X Coordinates, Y Coordinates

1) Needs Coordinates X, Y
2) Use like Any Data Point



DL = Distance X, Distance Y

1) DL = 10, 15
2) Distance X - 10 Master Units
3) Distance Y - 15 Master Units
3) From a Point or Tentative
4) Can Put in Negative Values



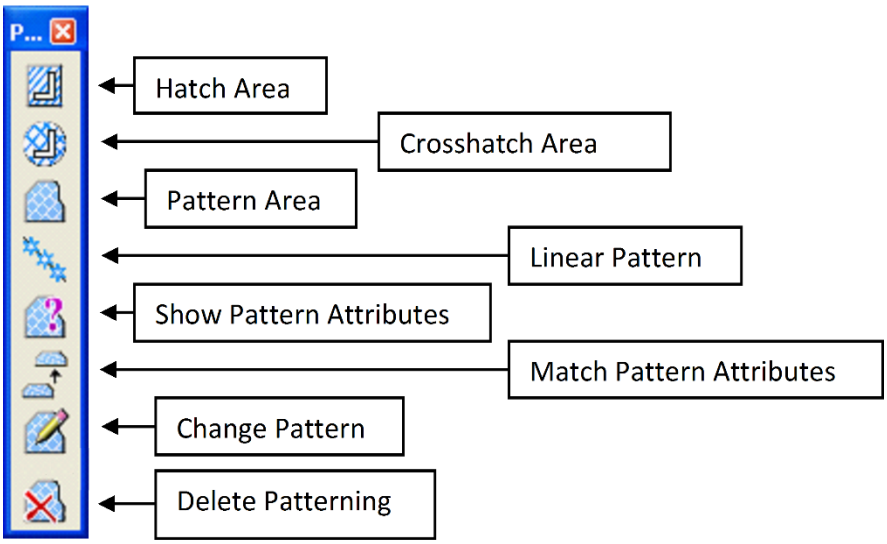
DI = Distance, Direction

1) Di = 5,30
2) Distance - Working Unit (5 Master Units)
3) Direction - Angle (30 = Thirty Degrees)
4) Can Put in Negative Values

Go to **Lab 5** to continue precision input.

CHAPTER 6

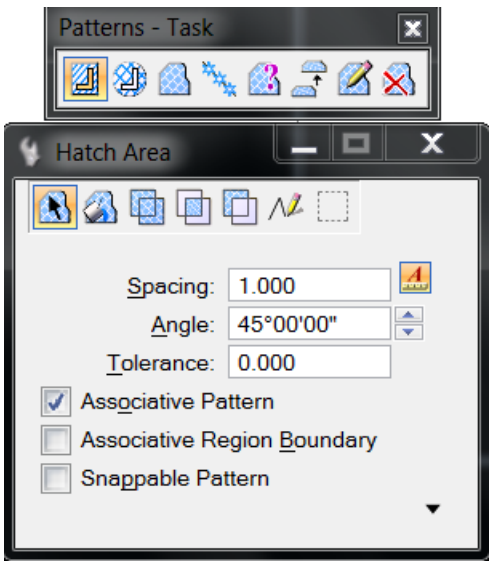
PATTERNING PALETTE



NOTE:

1. Where there is spacing required, make sure you have a number other than zero entered or you will have an unusable file.
2. If Associative Pattern is turned on, when the element is manipulated the pattern will automatically adjust to the new shape.
3. If "Snappable Pattern" is turned on, "Snappable" points will be included as part of the pattern.

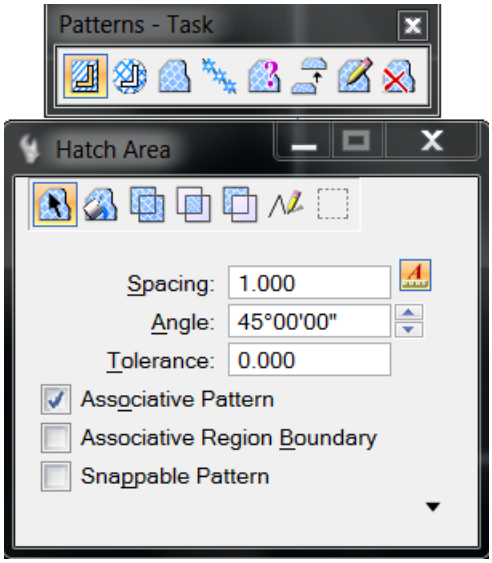
Hatch Area Inside Closed Element



1. Select Hatch Area command.
2. Set Method to Element.
3. Identify Element.
4. Data point to define a point through which a hatch line must pass.

Keyin: Hatch Element

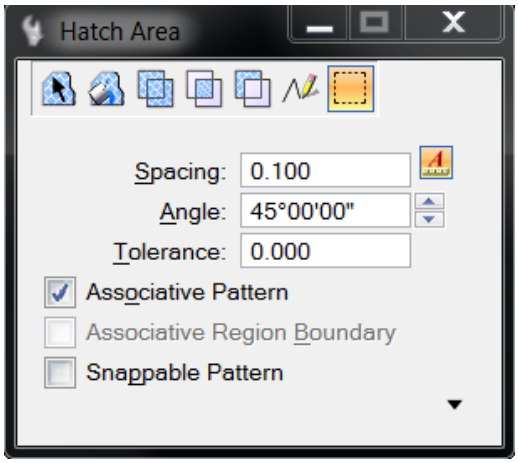
Hatch Area Between Multi-Line Components



1. Select Hatch Area command.
2. Set Method to Element.
3. Identify one component to be boundary of hatched area.
4. Identify the other component to be boundary of hatched area. If Associative Pattern is off, this data point defines a point through which one of the hatch lines must pass. If Associative Pattern is on, the hatch pattern is associated with the multi-line and one of the hatch lines must pass through one of the multi-line=s vertices.
5. Press Reset

Keyin: Hatch Element

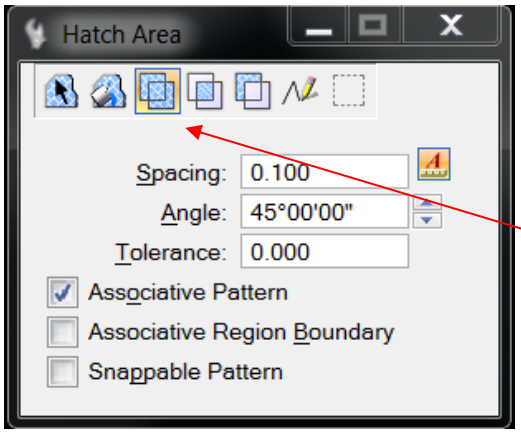
Hatch Fenced Area



1. Select Hatch Area command.
2. Set Method to Fence.
3. Data point to define a point through which a hatch line must pass

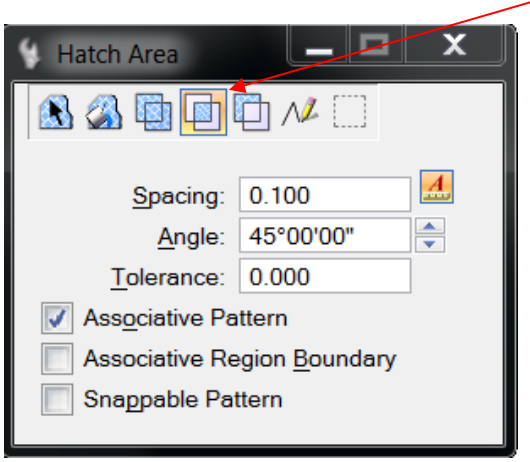
Keyin: Hatch Fence

Hatch Intersection or Union of Closed Elements

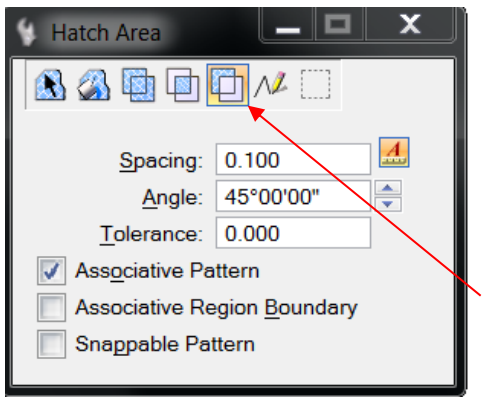


1. Select Hatch Area command.
2. Select the elements.
3. Set Method to Intersection or Union.
4. Data point to define a point through which a hatch line must pass.
5. Reset to complete

Keyin: Hatch Union or Intersection



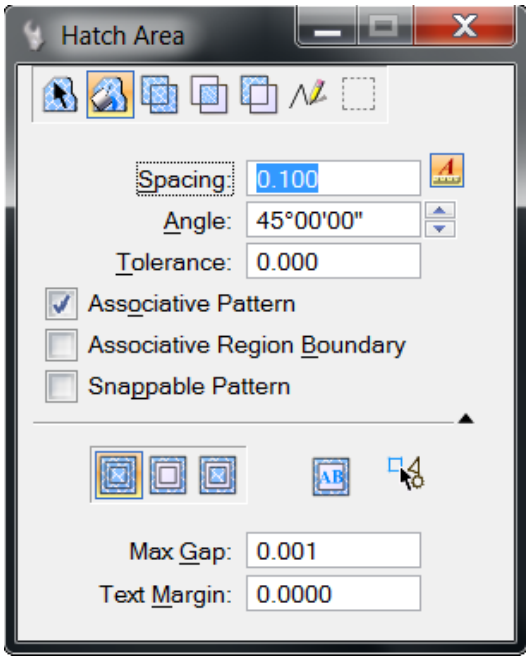
Hatch Area Difference Between Elements



1. Select Hatch Area command.
2. Set Method to Difference.
3. Identify Element from which to subtract.
4. Identify Element(s) to subtract.
5. Reset to complete.

Keyin: Hatch Difference

Hatch Area Enclosed by Bounding Elements

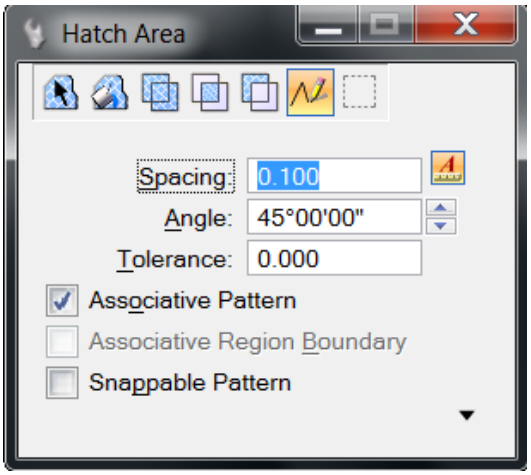


Note: Max Gap is the maximum space between elements. If the gap between elements is larger than this value, it will continue to search the file until it hits the edge of the design file. To minimize computing time to find the elements, zoom into the area of interest or select the bounding elements before selecting command.

1. Select Hatch Area command.
2. Set Method to Flood.
3. Enter a data point in the area enclosed by bounding elements.
4. Accept the hatching.

Keyin: Hatch Flood

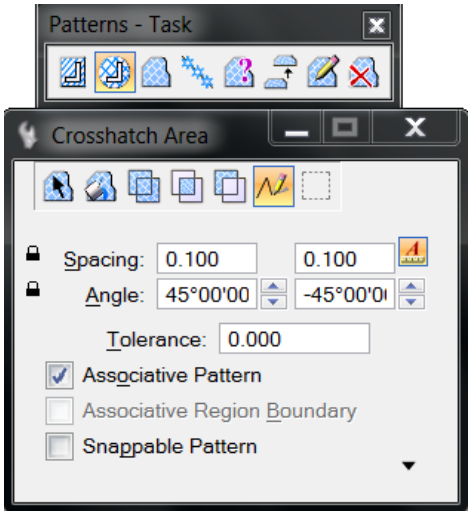
Hatch Area Defined by Data Point



1. Select Hatch Area command.
2. Set Method to Point.
3. Data point to define each vertex of shape that encloses the area.
4. Reset to complete.

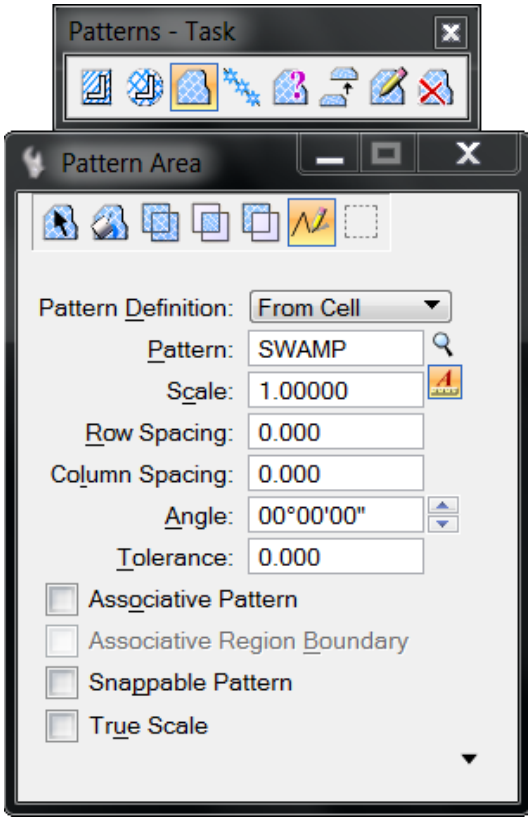
Keyin: Hatch Points

Crosshatch Area



Command settings and procedures are the same as Hatch Area commands except that an additional spacing and angle must be defined. Note: Do not use spacing =0 and use different angles so that cross hatch will appear.

Pattern Area Inside Closed Element

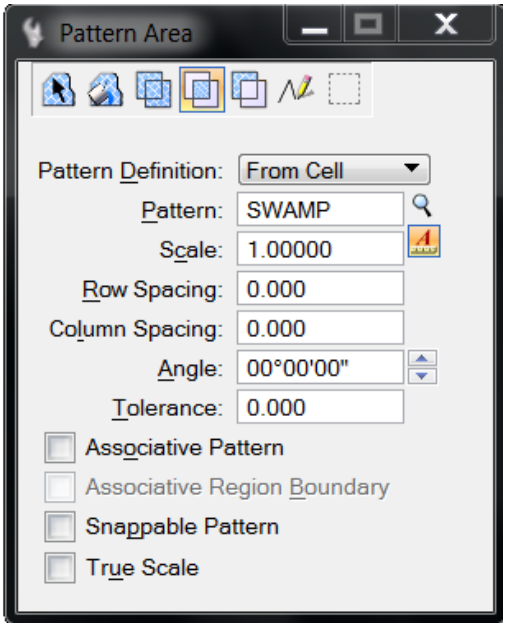


1. Select Pattern Area command.
2. Set Method to Element.
3. Fill in Pattern cell name, scale, spacing & angle. Note: Never use scale = 0. This will blow up your design file!
4. Identify Element.
5. Data point to place the origin of the pattern cell.

Keyin: Pattern Area Element

Pattern Area: Pattern an area by tiling the active pattern cell/definition.
Linear Pattern: Place active pattern cell along an element.
Show Pattern Attributes: Display the pattern angle and pattern scale of a pattern element.
Match Pattern Attributes: Change the active pattern attributes to match those of an existing pattern element.
Change Pattern: Change pattern/hatch properties.
Delete Patterning: Delete patterning

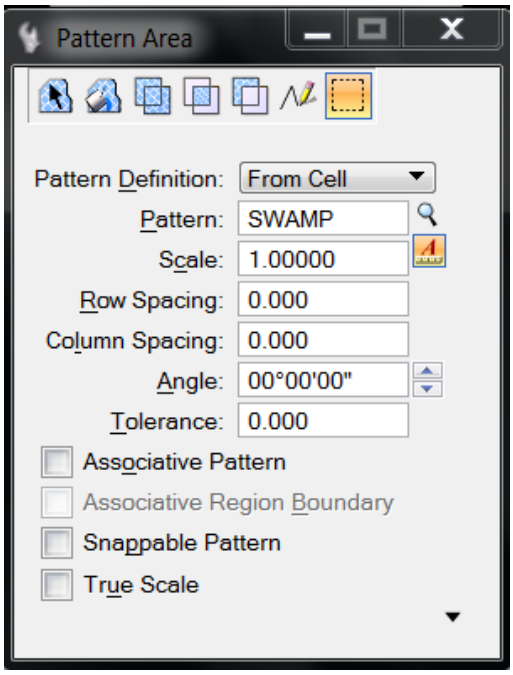
Pattern Intersection or Union of Closed Elements



1. Select Pattern Area command.
2. Set Method to Intersection or Union.
3. Fill in Pattern cell name, scale, spacing & angle. Note: Never use scale = 0. This will blow up your design file!
4. Select the closed elements.
5. Enter Data point away from elements.
6. Reset to complete.

Keyin: Pattern Area Intersection or Union

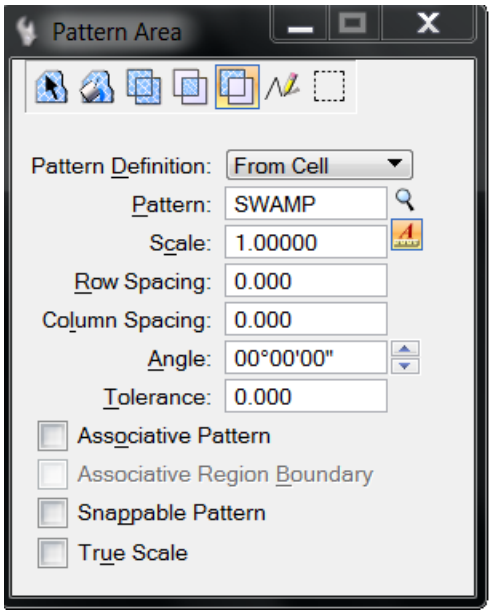
Pattern Fenced Area



1. Select Pattern Area command.
2. Set Method to Fence.
3. Fill in Pattern cell name, scale, spacing & angle. Note: Never use scale = 0. This will blow up your design file!
4. Data point to place the origin of one of the pattern cell instances.

Keyin: Pattern Area Fence

Pattern Area Difference Between Elements

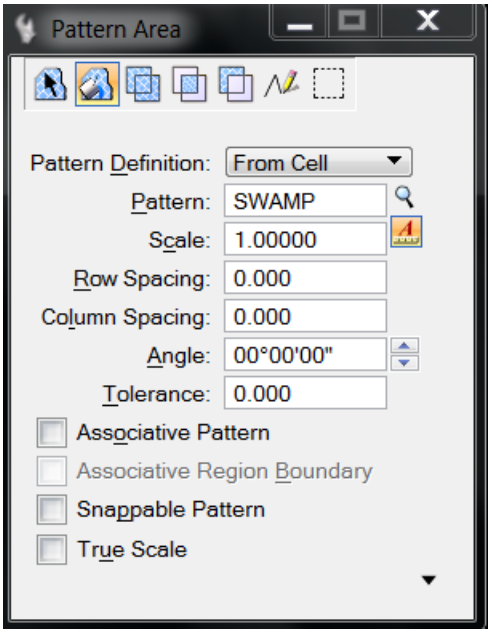


1. Select Pattern Area command.
2. Set Method to Difference.
3. Fill in Pattern cell name, scale, spacing & angle. Note: Never use scale = 0. This will blow up your design file!
4. Identify Element from which to subtract.
5. Identify Element(s) to subtract.
6. Reset to complete.

Keyin: Pattern Area Difference

Pattern Area Enclosed by Bounding Elements

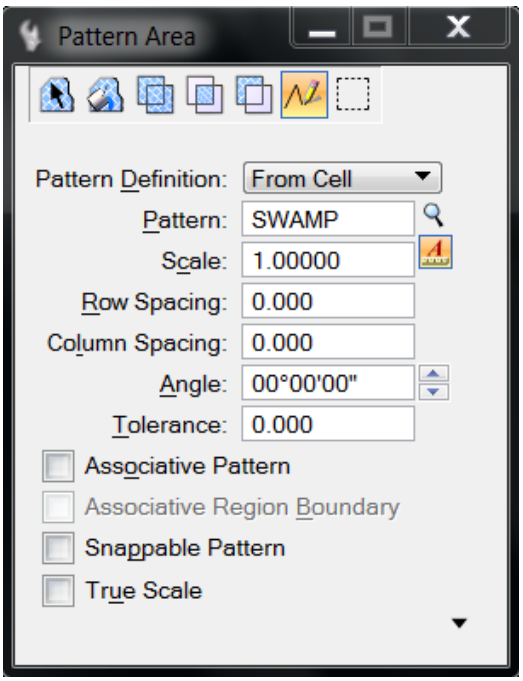
Note: Max Gap is the maximum space between elements. If the gap between elements is larger than this value it will continue to search the file until it hits the edge of the design file. To minimize computing time to find the elements, zoom into the area of interest or select the bounding elements before selecting command.



1. Select Pattern Area command.
2. Set Method to Flood.
3. Fill in Pattern cell name, scale, spacing & angle. Note: Never use scale = 0. This will blow up your design file!
4. Data point area enclosed by bounding elements.
5. Accept the patterning.

Keyin: Pattern Area Flood

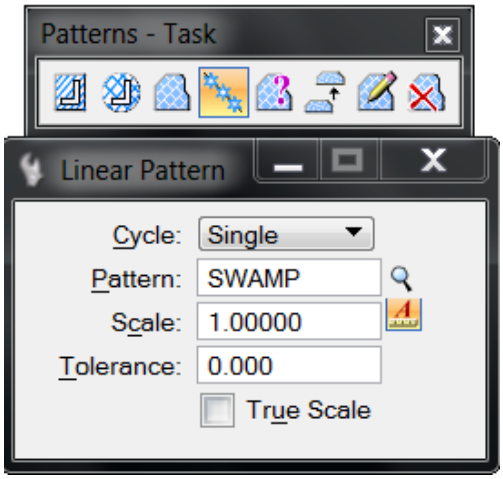
Pattern Area Defined by Data Point



1. Select Pattern Area command.
2. Set Method to Point.
3. Fill in Pattern cell name, scale, spacing & angle. Note: Never use scale = 0. This will blow up your design file!
4. Data point to define each vertex of shape that encloses the area.
5. Reset to Complete.

Keyin: Pattern Area Points

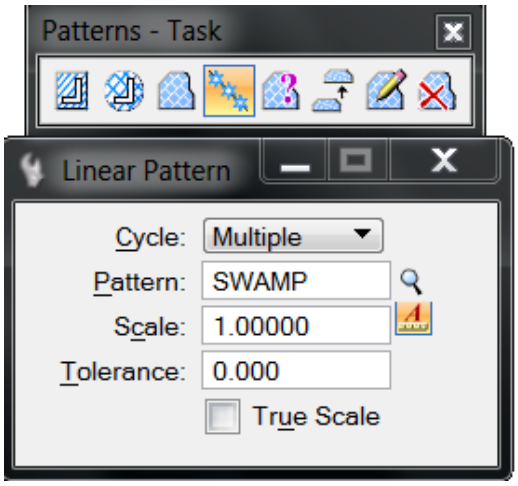
Single-cycle Segment Linear Pattern



1. Select Linear Pattern command.
2. Set Cycle to Single.
3. Fill in Pattern cell name & scale. Note: Never use scale = 0. This will blow up your design file!
4. Data point to select element.
5. Data point to indicate pattern direction.
6. Only One Cell per Segment.
7. Original Element Replaced by Pattern.

Keyin: Pattern Line Single

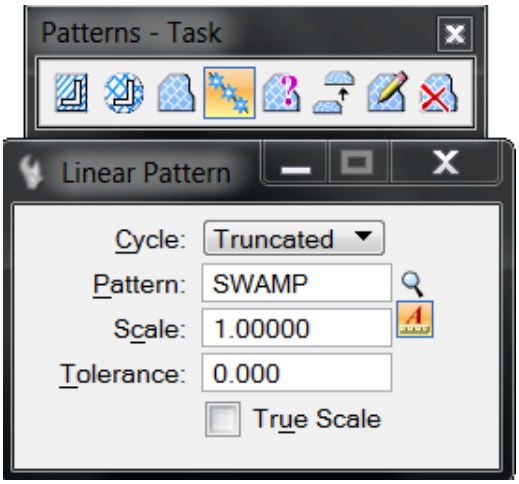
Multi-cycle Segment Linear Pattern



Select Linear Pattern command.
1. Set Cycle to Multiple.
2. Fill in Pattern cell name & scale. Note: Never use scale = 0. This will blow up your design file!
3. Data point to select element.
4. Data point to indicate pattern direction.
5. All Cell Scale on Each Segment.
6. Original Element Replaced by Pattern.

Keyin Pattern Line Multiple

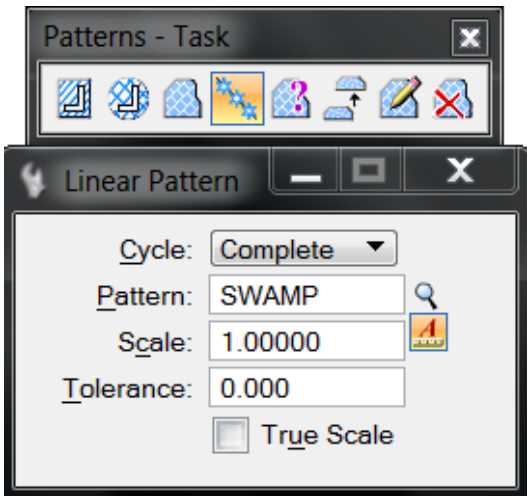
Truncated Cycle Linear Pattern



1. Select Linear Pattern command.
2. Set Cycle to Truncated.
3. Fill in Pattern cell name & scale. Note: Never use scale = 0. This will blow up your design file!
4. Data point to select element.
5. Data point to indicate pattern direction.
6. All Cell Original Size.
7. Original Element Replaced by Pattern.

Keyin: Pattern Line Element

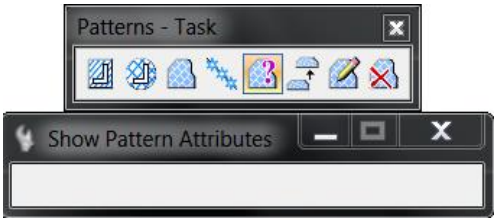
Complete Cycle Linear Pattern



1. Select Linear Pattern command.
2. Set Cycle to Complete.
3. Fill in Pattern cell name & scale. Note: Never use scale = 0. This will blow up your design file!
4. Data point to select element.
5. Data point to indicate pattern direction.
6. All Cells Scale So There Are No Partial Cells.
7. Original Element Replaced by Pattern.

Keyin: Pattern Line Scale

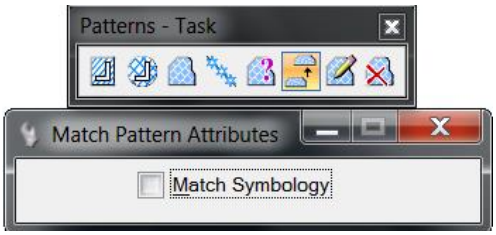
Show Pattern Attributes



1. Select Show Pattern Attributes command.
2. Identify pattern element.
3. Accept pattern element.

Keyin: Show Pattern

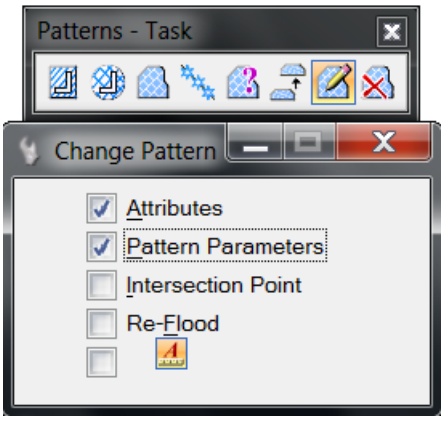
Match Pattern Attributes



1.Select Match Pattern Attributes command.
2.Identify pattern element.
3.Accept pattern element.

Keyin: Active Pattern Match

Change Pattern Attributes



1. Select Change Pattern command.
2. Identify pattern to use for settings.
3. Accept change.

Keyin: Modify Pattern

Select "**Pattern Parameters**" to use current line spacing.

Delete Pattern

1. Select Delete Pattern command.
2. Identify pattern to delete.
3. Accept deletion.

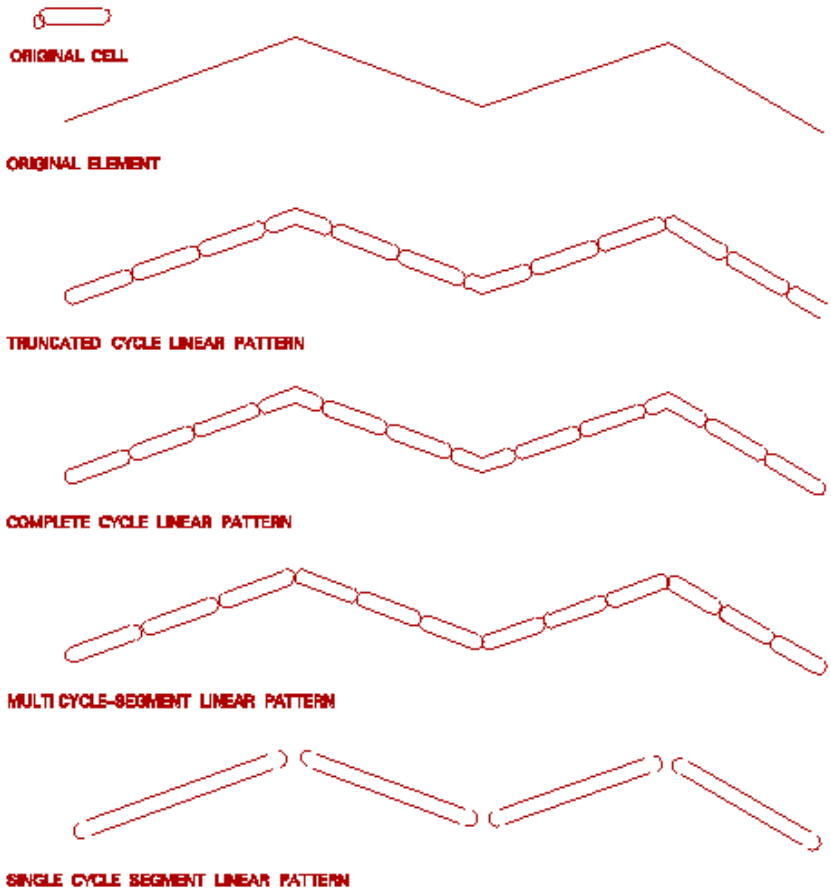
Keyin: Delete Pattern

LINEAR PATTERNING EXERCISE

1. Place a line string.
2. Copy three times.
3. Set attributes:
    a. Pattern cell name = PGR [Proposed guardrail.]
    b. Pattern Scale =1.
4. Select command.
    a. 1st data point.
    b. 2nd data point accepts and indicates direction of pattern flow.

In Command Window in the special messages area A Pattern Task Initiated will appear.

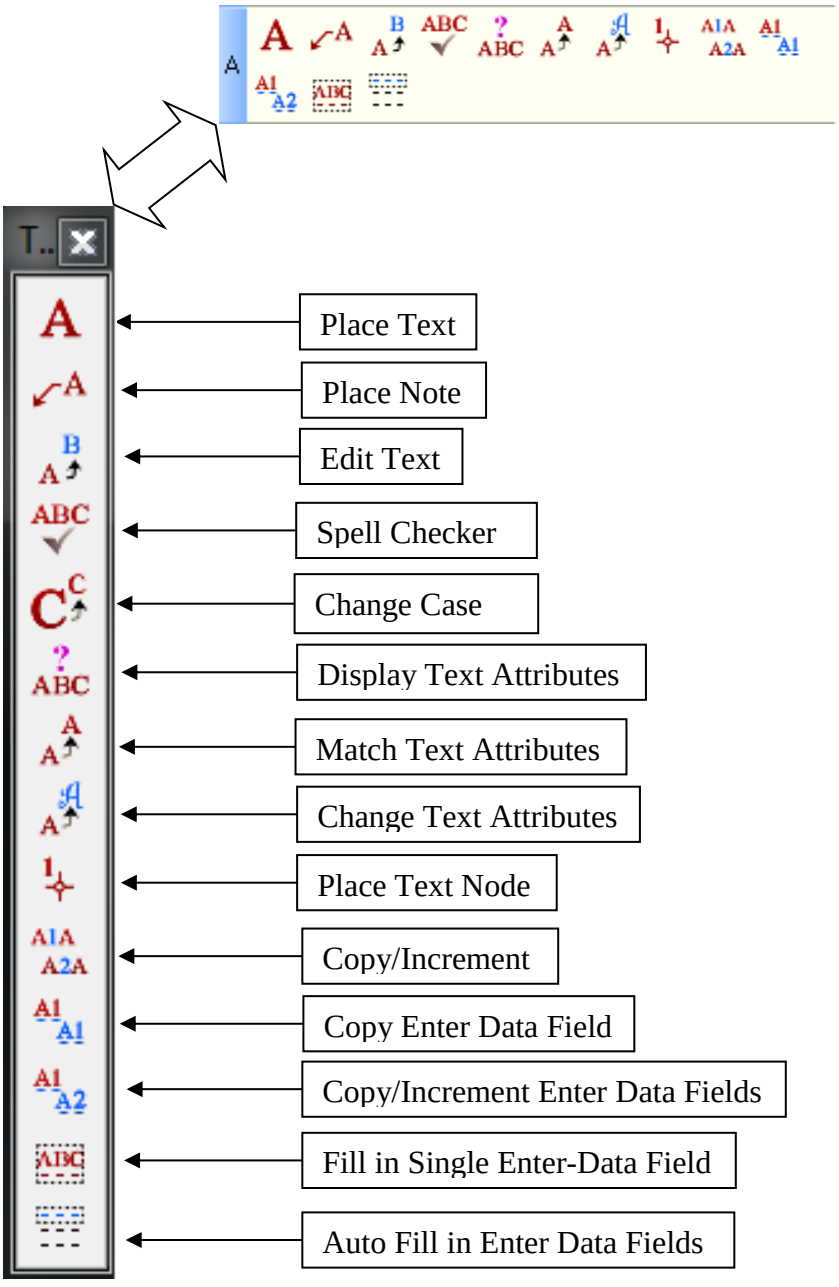
EXAMPLES OF PATTERN PROCESS COMPLETE or PATTERN INTERSECTIONS



CHAPTER 7

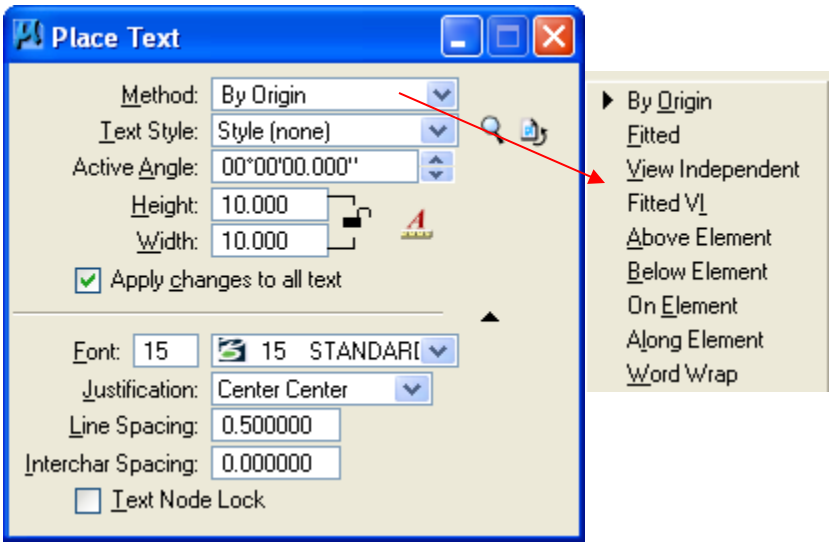
TEXT MENU

Text Sub-Palette



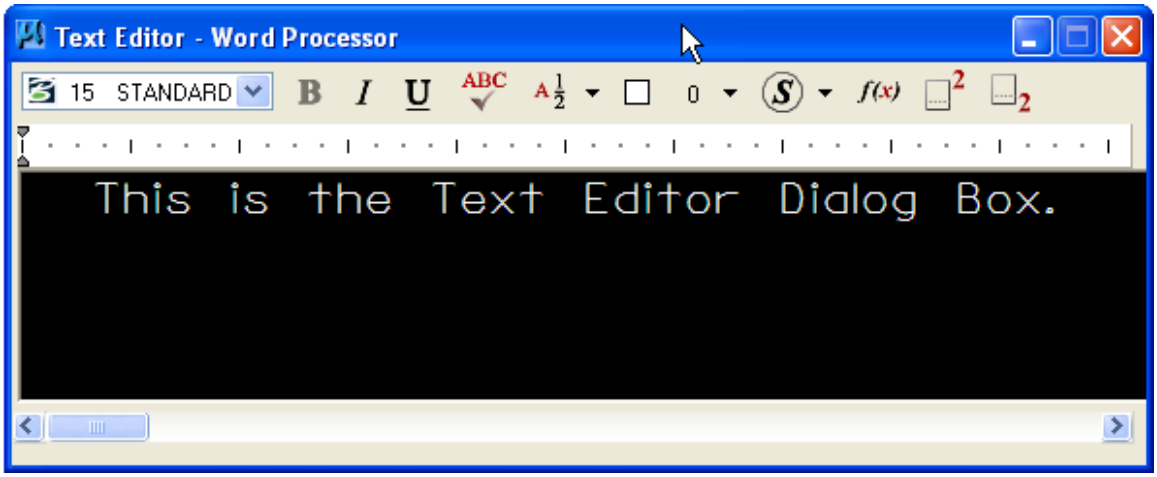
Place Text

To place text in a file:



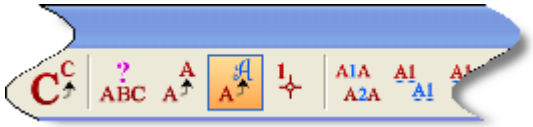
1. Select Place Text command.
2. Set Method to By Origin.
3. In the Text Editor, type the text.
4. Enter a data point to position the origin of the text element

Key-in: Place Text



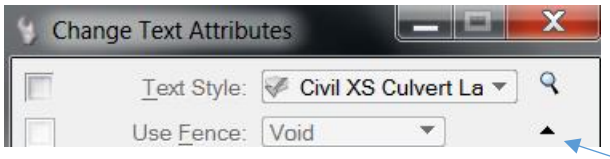
Change Text Attributes

To change the text attributes:



1. Select Change Text to Active Attributes command.
2. Identify and accept the text

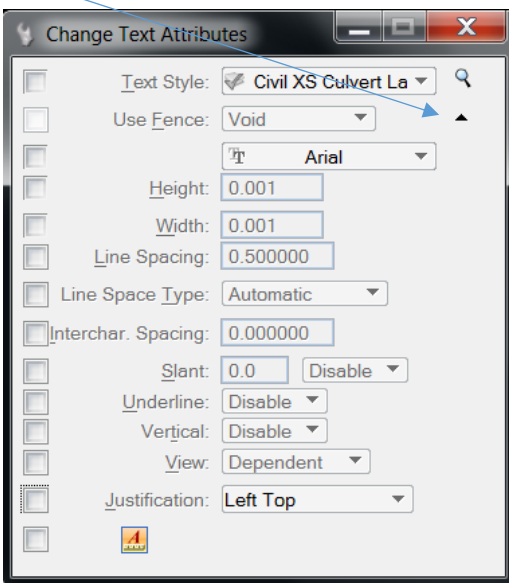
Key-in: Modify Text



Height & Width

Sets the size of the characters & can be locked to keep the same for both dimensions

Keyin: TH = Text Height (File Designable)
TW = Text Width (File Designable)
TX = Text Size (File Designable).

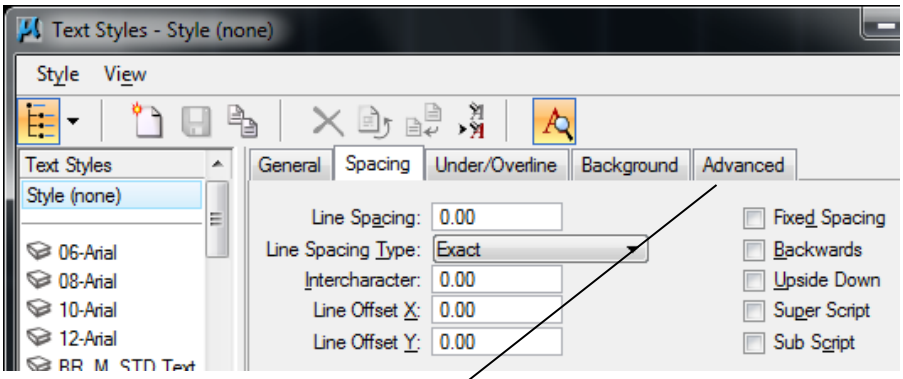


Font

Refers to the type of text character
Keyin: FT = Active Font (File Designable)

Justification

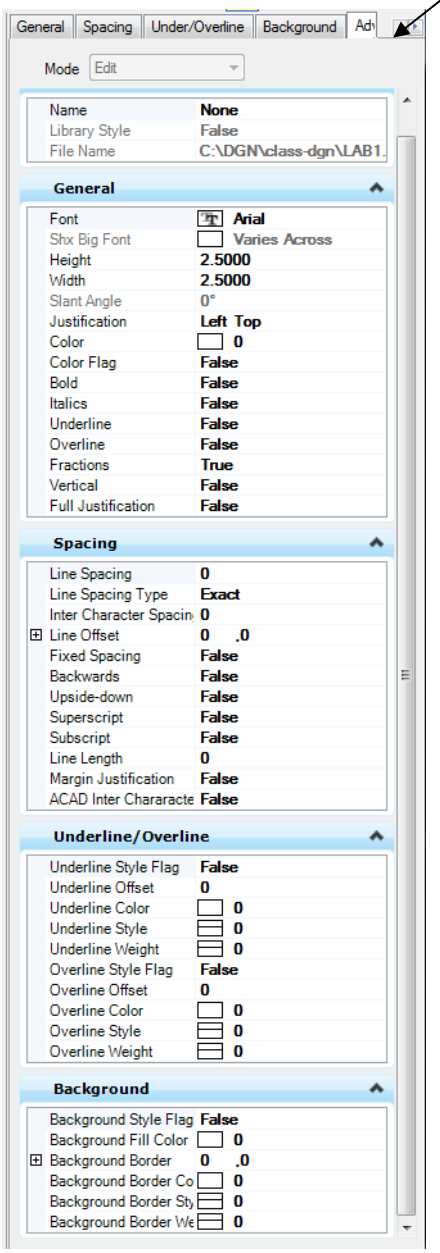
Sets the justification of placement of the font.



Line Spacing

Sets the space between multiple lines of text.
Keyin: LS = Line Spacing (Generally about Half Text Height) (File Designable)

Menu: Under ***Element*** > ***Text styles***



Length

Sets the maximum number of characters allowed on one line.
Keyin: LL = Line Length (File Designable) (Max. Length = 255 Characters)

View

(Active text settings are set in the Text Settings box.)

1) Opens the Font dialog box to view the available fonts

Keyin: DF = View Available Fonts

Text Editor

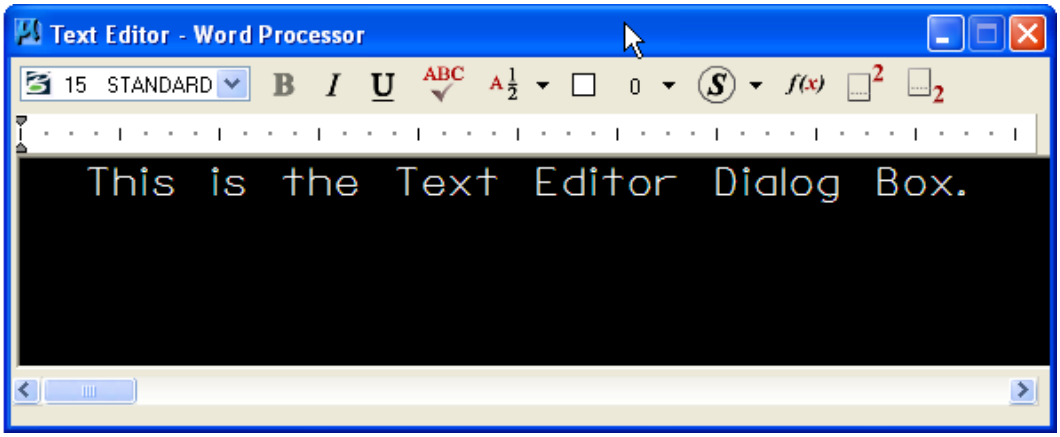
Edit Text

To edit the text:

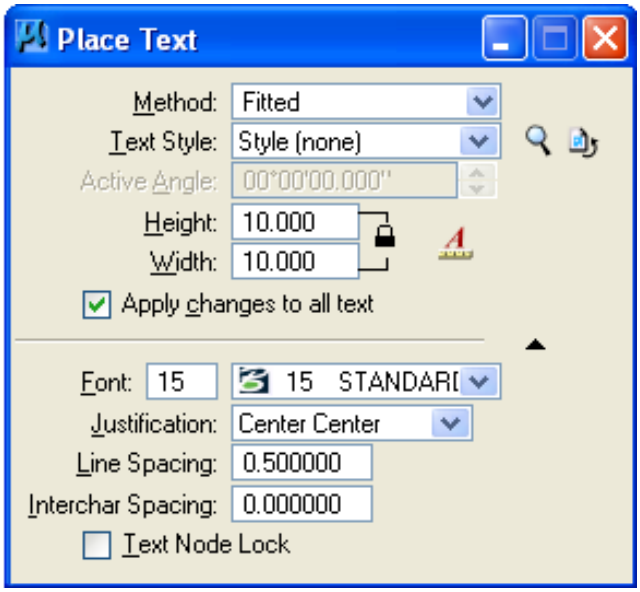
1. Data point on text to edit and accept.

2. The Text Editor window will open.
3. Make changes, click in drawing to accept.

Key-in: Edit Text



Placed Fitted Text



To place fitted text:

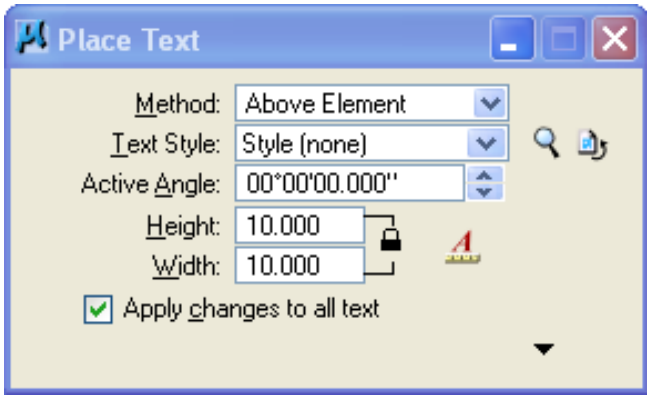
1. Select Place Text command.
2. Set Method to Fitted.
3. In the Text Editor, type the text.
4. Enter a data point to define the left end of the fitted text.
5. Enter a data point to position the right end of the text and define the height, width, and rotation angle (This interactively places text)

Key-in: Place Text Fitted

Key-in: Place Text Fitted

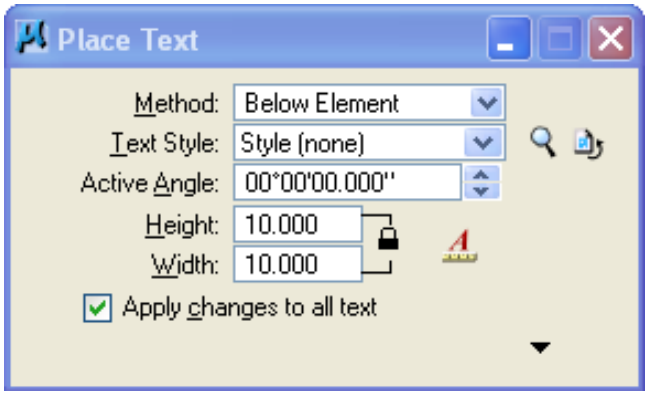
Place Text above/below Element

To place text above and below an element:



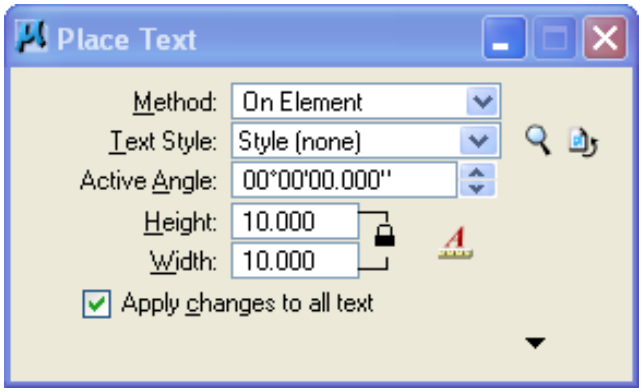
1. Select Place Text command.
2. Set Method to Above Element or Below Element Note: For line elements only.
3. In the text editor, type text.
4. Identify the line segment.
5. Accept the text

Key-in: Place Text Above/Below



Place Text on Element

To place text on an element:

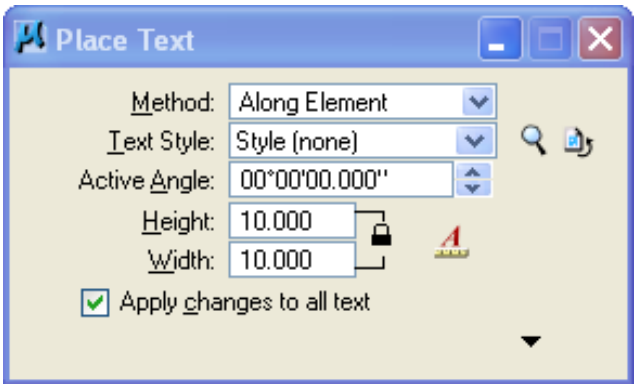


1. Select Place Text command.
2. Set Method to "On Element" Note: For line elements only.
3. In the text editor, type text.
4. Identify the element on which to place text and accept

Key-in: Place Text On

Place Text along Element

To place text along an element:



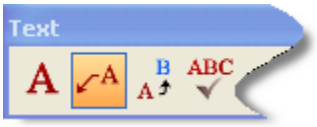
1. Select Place Text command.
2. Set Method to "Along Element"

Note: For curve elements only.

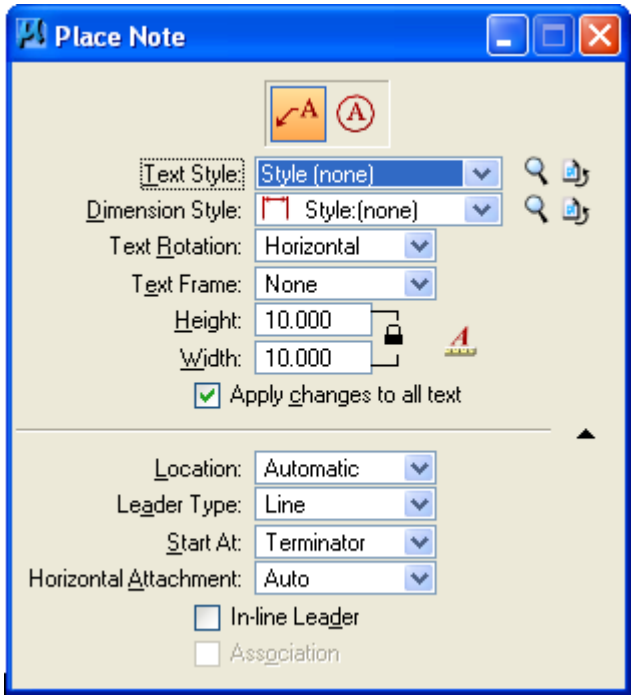
3. In the Text Editor, type text.
4. Enter a data point along the element to position the origin.
5. Enter a data point to position the text above or below the element

Key-in: Place Text Along

Place Note



To place a note on an element:



1. Select Place Note command.

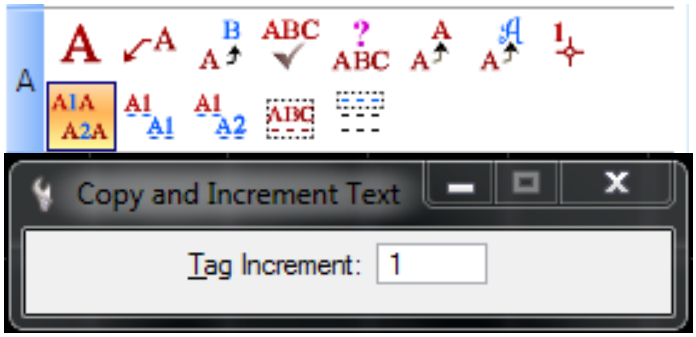
(NOTE: Text settings are determined by dimension attributes).

2. In the Text Editor, type text.
3. Enter a data point to position the arrowhead.
4. Enter a data point to define leader line

Key-in: PLACE NOTE

Copy & Increment Text

To copy and increment text:

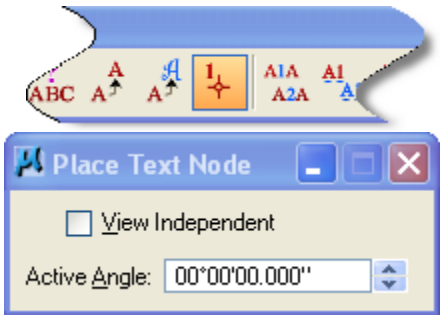


1. Select Copy and Increment Text command.
2. Set the tag increment (between 1 and 32767).
3. Identify the text element to copy and increment Note: Text must contain a number to increment.
4. Enter a data point to position text

Key-in: Increment Text

Place Text Node

To place a text node:



1. Select *Place Text Node comm*and.
2. Enter a data point to position node

Match Text

To match text attributes:

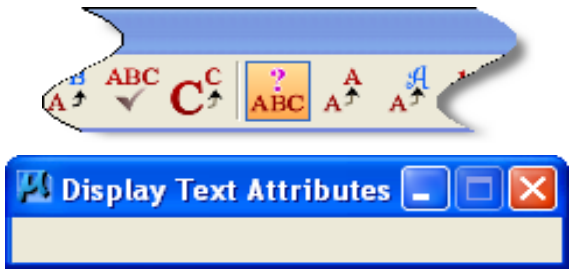
1. Select *Match Text Attributes* command.
2. Select a text element and accept

Use with *"**Change text attributes**" command to change existing text to the text just matched.

Key-in: Active Text

Display Text Attributes

To display text attributes:



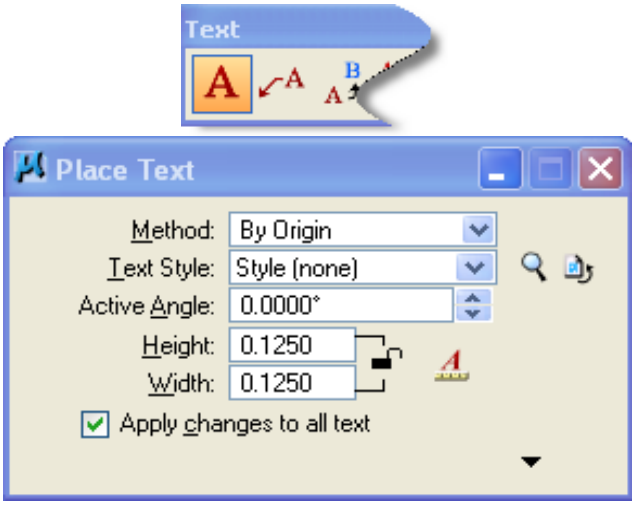
1. Select Display Attributes of Text Element command.
2. Identify and accept the text element.
3. Special message area in Command Window will display the text attributes

Key-in: Identify Text

NOTE: To see these make sure Data Fields is turned on in View Attributes.

Place Enter Data Fields

To place enter data fields:



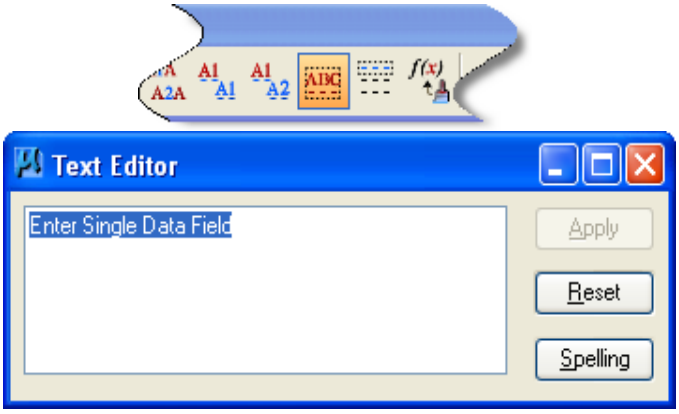
1. Select Place Text command. Note: The active text settings at the time the Enter Data Fields are placed will remain when the fields are filled in.
2. Type in number of underbars desired (shift/-).
3. Data point to place the enter data field.

Key-in: Place Text

Note: Enter data fields are found in standard files such as a Title sheet. They are used to set standard fonts and sizes so that plans will appear uniform. They are simply empty spaces reserved in a design file for standard information.

Enter Data Fill in Singular

To enter data, fill in singular:

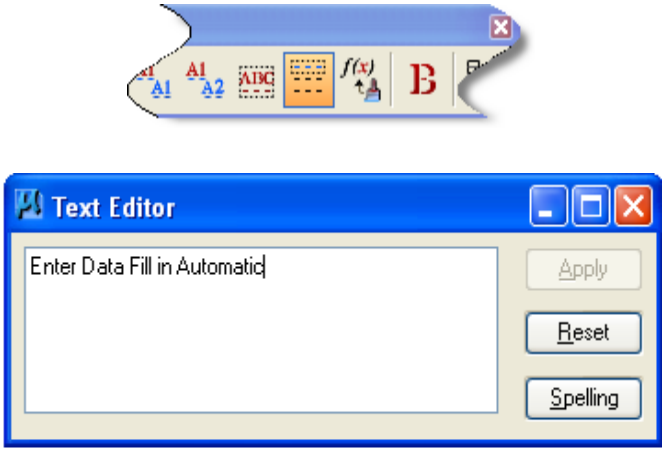


1. Select Fill in Single Enter Data Field command.
2. Identify the enter data field.
3. Key in the text editor the contents for the enter data field Note: If you enter more characters than you have spaces, the entry will be truncated.
4. Press <ENTER> to accept

Key-in: Edit Single

Enter Data Fill in Automatically

To enter data, fill in automatically:



1.Select Automatic Fill in Enter Data Fields command.
2.Select desired view.
3.Key in the text editor the contents of the data field Note: If you enter more characters than you have spaces, the entry will be truncated.
4.Press <ENTER> to accept and will move automatically to the next enter data field. Note: Data fields will be located in order of creation.
5.Repeat steps 3 & 4 or data point to skip to the next enter data field automatically.

Key-in: Edit Auto

Copy Enter Data Fields

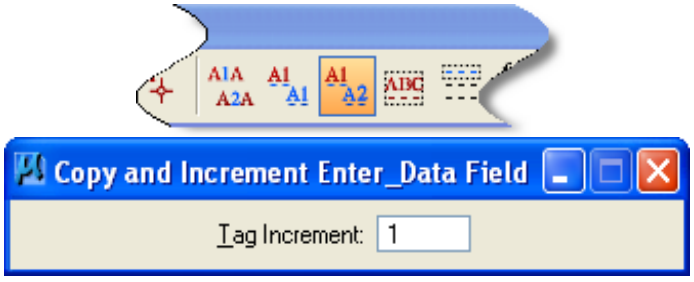
To copy enter data field:

1. Select Copy Enter Data Field command.
2. Identify the enter data field with test to be copied.
3. Identify the destination enter data field for the text.
4. Reset to stop copying or choose a new destination.

Key-in: Copy ED

Copy & Increment Enter Data Field

To copy and increment enter data field:



1. Select Copy and Increment Enter Data Field command.
2. Set the tag increment (between 1 and 32767).
3. Identify the enter field to copy and increment.
4. Identify the destination of the enter data field.

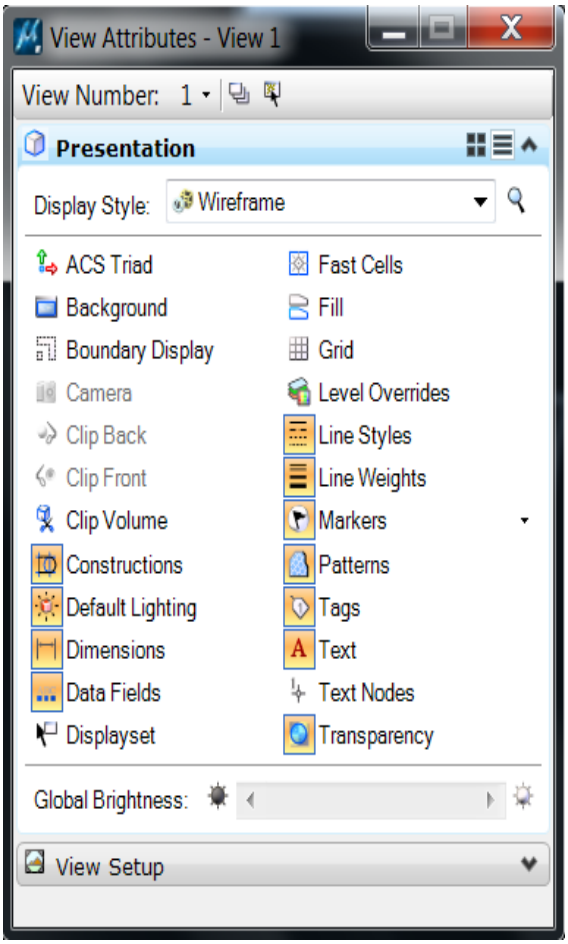
Key-in: Increment ED

Enter Data Justify

To enter data, justify:

1. Key-in: Justify Left/Right/Center.
2. Identify the enter data field. (This is to change justification on existing or copied enter data fields).

VIEW ATTRIBUTE MENU



Multi-line Text Nodes Display On/Off

1. Toggle Text Nodes On/Off (Default - Off).
2. Select View.
3. Select Apply or All

Key-in: Set Nodes On/Off

Text On/off

1. Toggle On/Off (Default - Off).
2. Select View.
3. Select Apply or All

Key-in: Set Text On/Off

Fast Font On/off

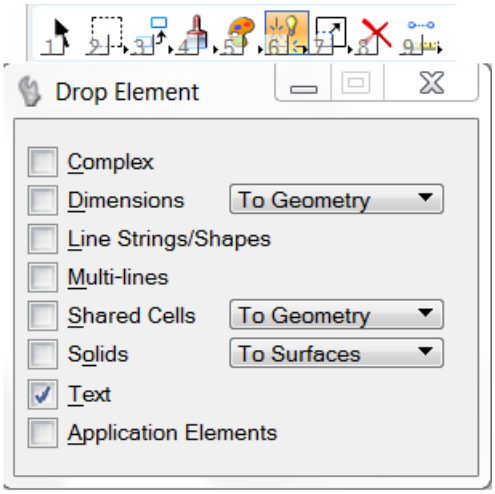
1. Toggle On/Off (Default - Off).
2. Select View.
3. Select Apply or All

Key-in: Set Font On/Off

If the data field is not visible open the View Attributes Menu.
Use the pull-down menu Settings > View Attributes or key in CTRL B

DROP ELEMENT SUB-PALETTE

Drop Text

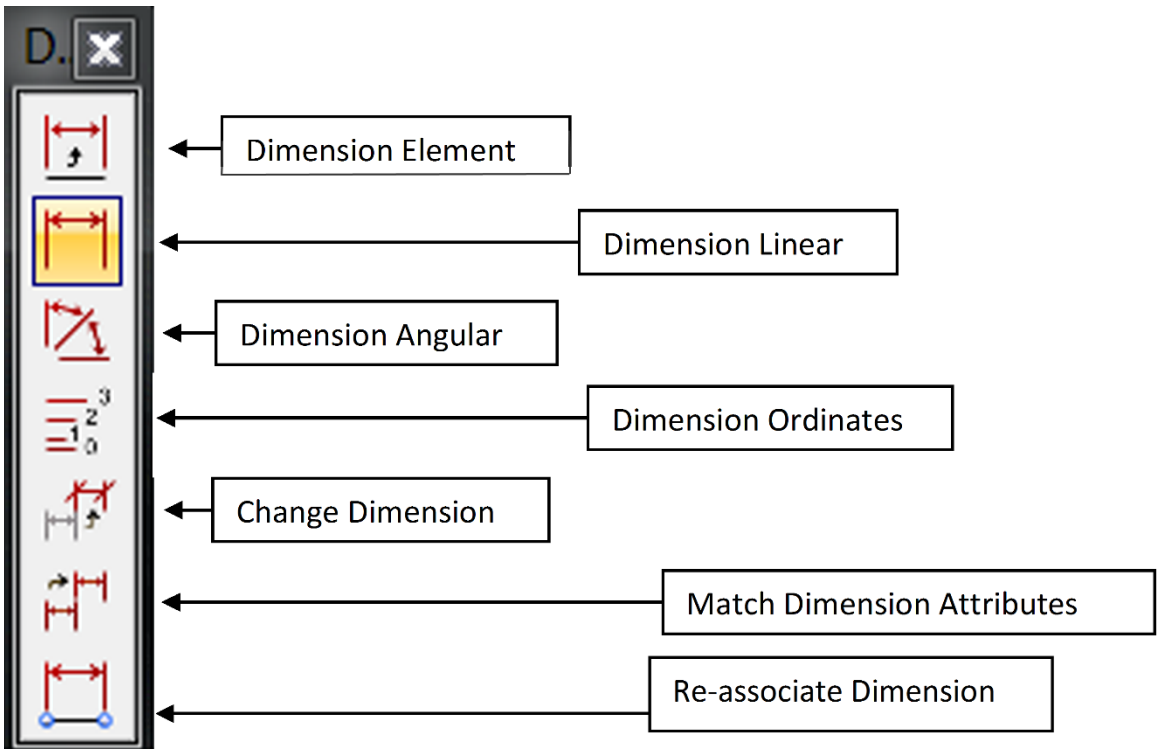


To drop text:

1. Select Drop Text command.
2. Identify and accept the text element

Key-in: Drop Text

DIMENSIONING SUB-PALETTE



Association lock must be on to allow Dimensions to change with modifications

Dimension Element: Place a dimension on an element.
Dimension Linear: Place a linear dimension between two points.
Dimension Angular: Place an angular dimension.
Dimension Ordinates: Label distances along an axis.
Change Dimension: Change a dimension to active dimension settings.
Match Dimension Attributes: Change the active dimension attributes to match those of an existing dimension element.
Re-associate Dimensions: Re-associate dimensions *Tags Sub-palette*

CHAPTER 8

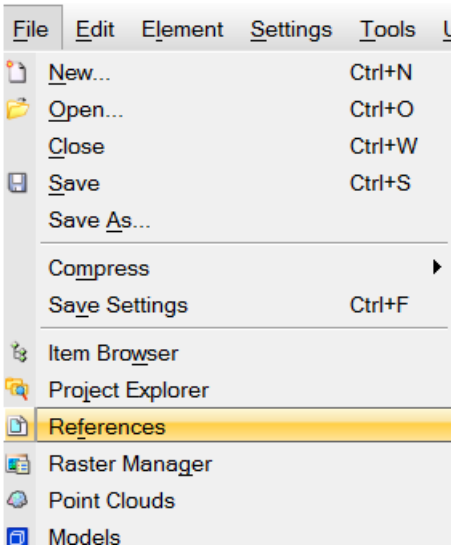
Reference Files

Open Reference Menu
You can open the Reference Menu on the pull-down menu under File > Reference or from the icon on the Primary Tool bar.

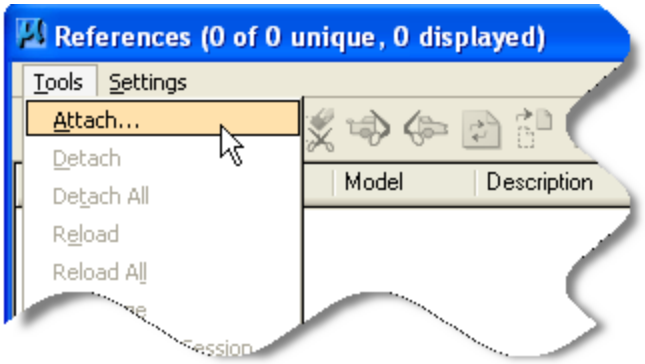
Key-in: RF= (Reference File Name)

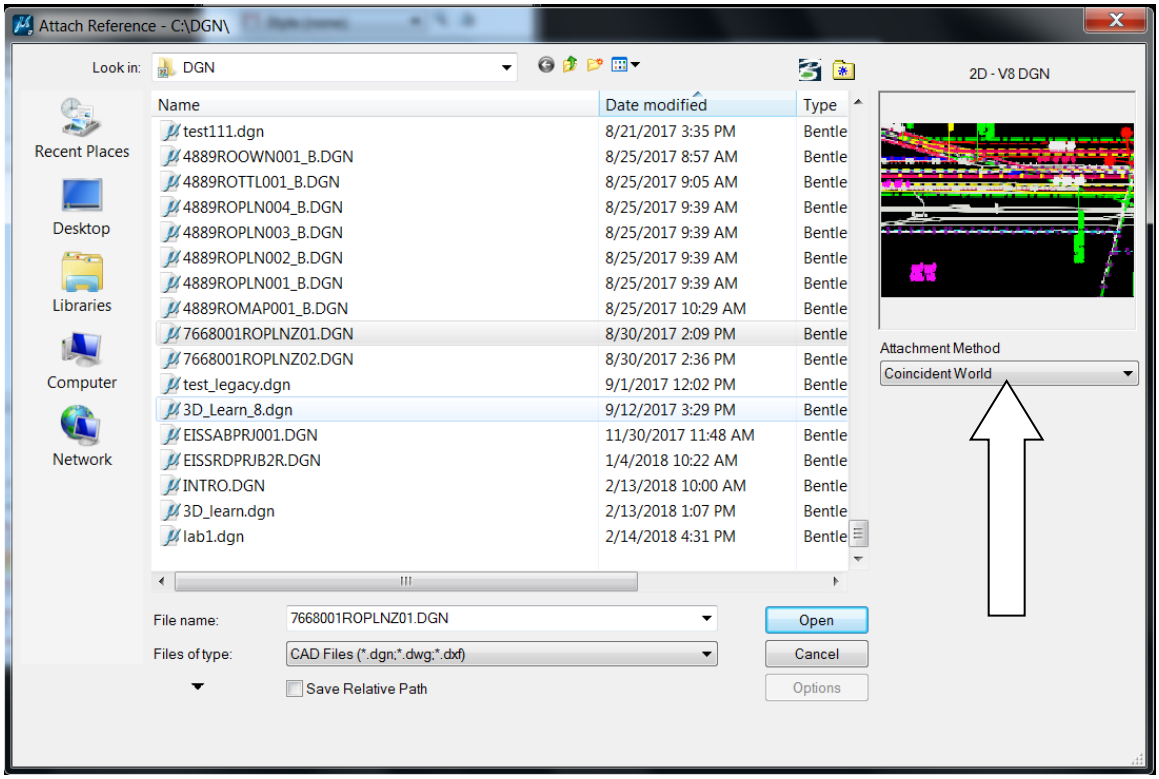
Primary Tool Bar

File Pull Down



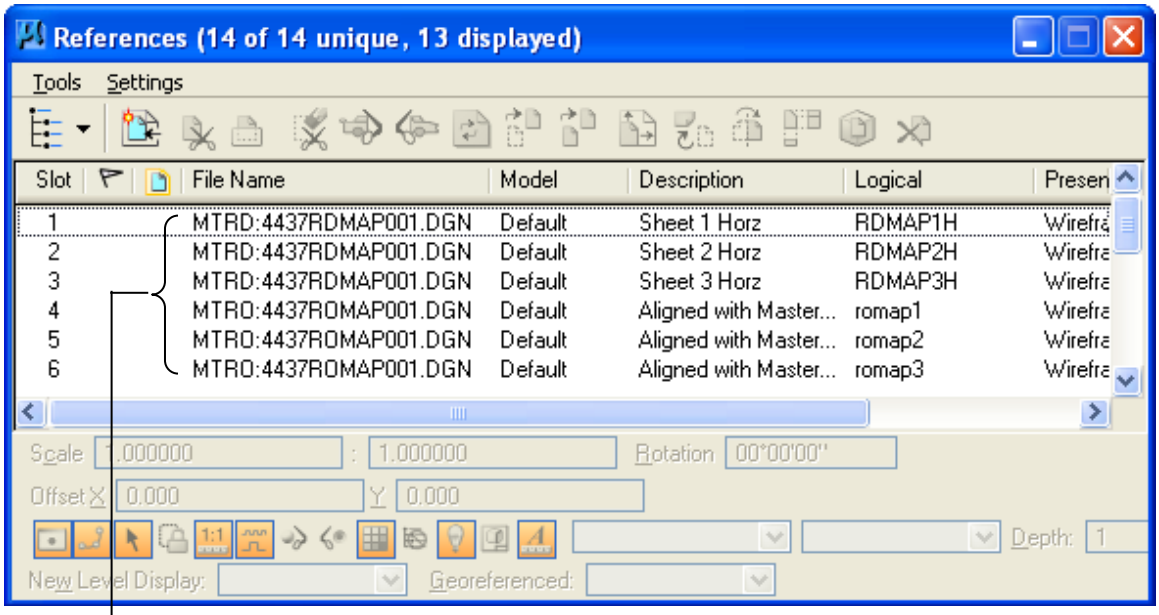
To attach a reference file, click on Tool > Attach. Navigate to correct directory and pick the file you want to attach.





Choose Coincident World for Orientation. Logical Name and Model will not be discussed in this course.

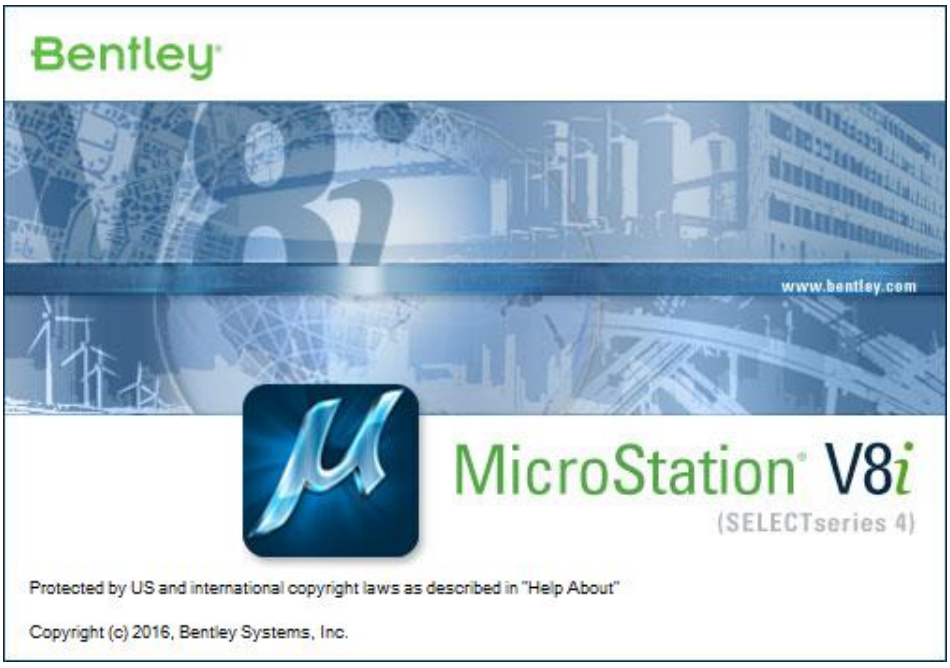
Once the file is attached the menu will look like this. This picture has all the “logicals” and prefixes attached for this project.



DMS: MDT’s document management system “DMS” and Doc-u-plot require a prefix that satisfies file paths in this case MTRD: which is Road Design’s path.

MICROSTATION® INTRODUCTION CLASS

Lab Section



LAB 1
DESIGN FILE CREATION EXERCISE

This exercise will result in the creation of the following files:

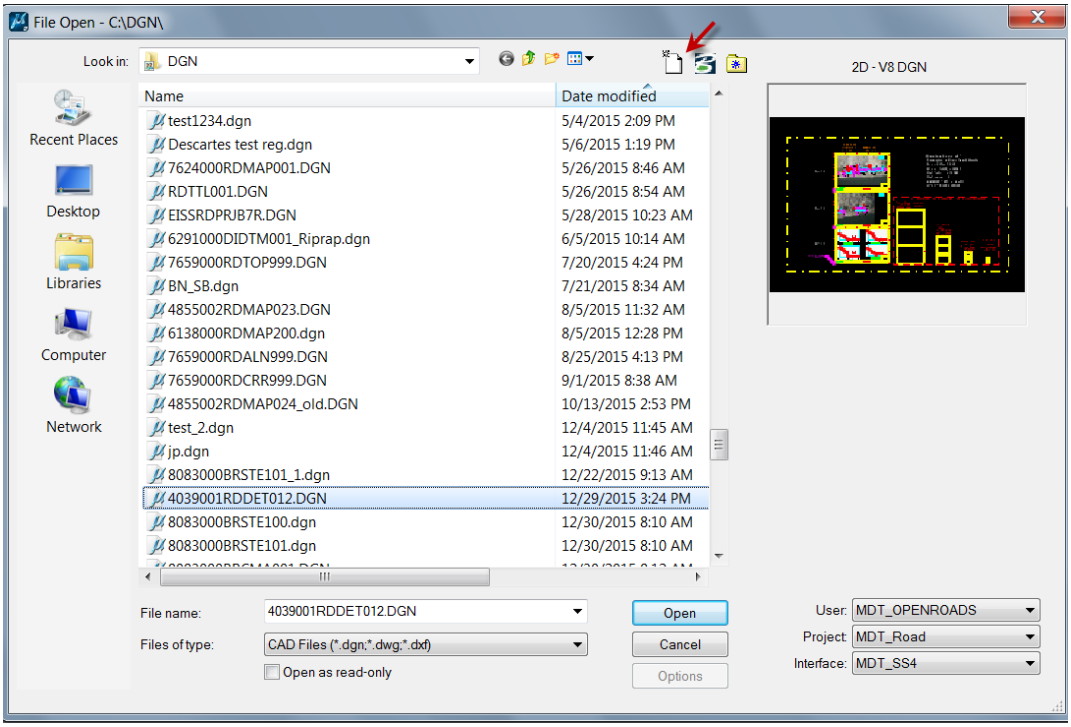
- c:\dgn\lab1.dgn
- c:\dgn\lab2.dgn

Objective:
Demonstrate comprehension of creating MicroStation design files using MicroStation manager, seed files, and working unit settings which match given criteria.

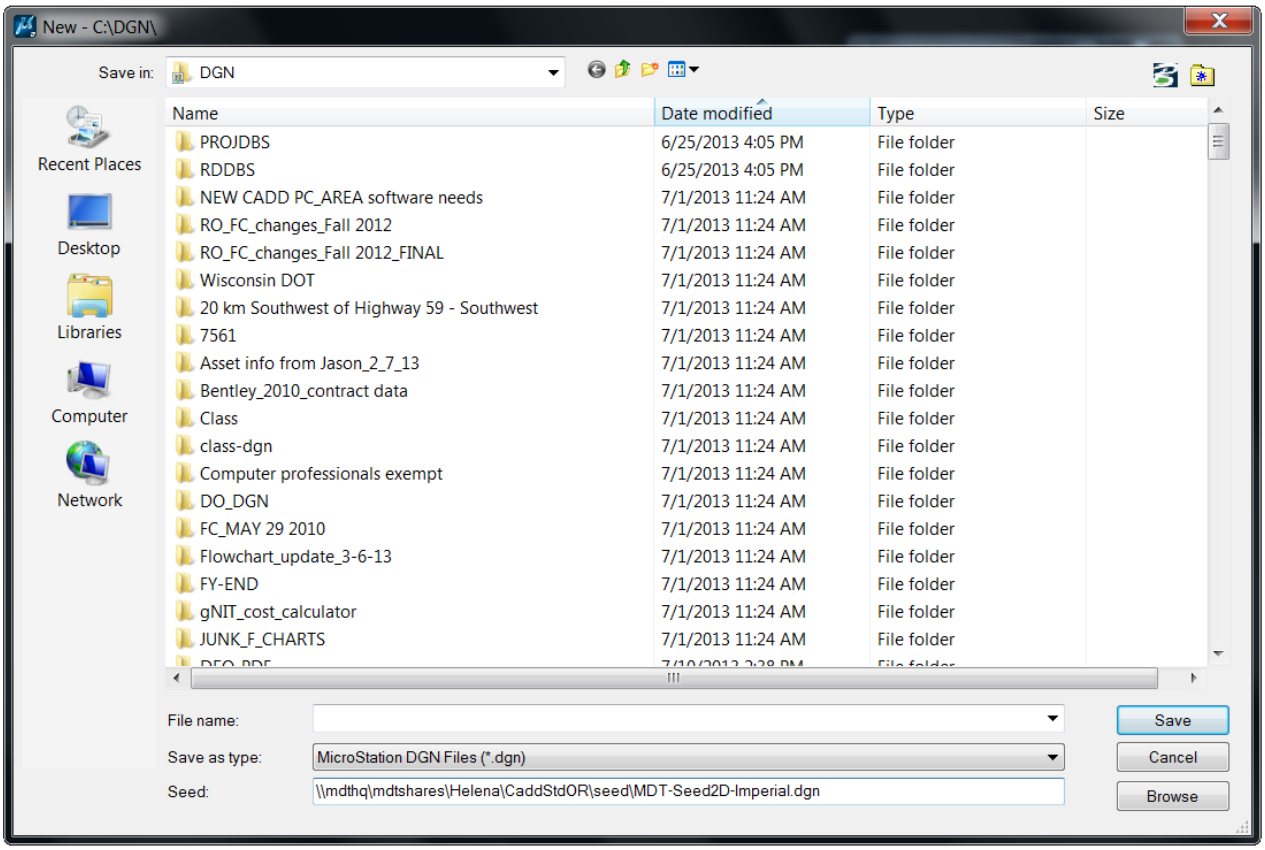
Criteria:
Create a design file named LAB1.DGN and LAB2.DGN when first activating MicroStation with the following criteria:

1. Place in c:\dgn directory.
2. Save Settings

Instructions: (utilize seed file: MDT-Seed2D-Imperial.dgn)
1. Exit completely out of MicroStation.
2. Initialize MicroStation using "**Preconstruction Startup" menu**
3. The first screen will be the MicroStation Manager, choose the New file option highlighted below.
4. The Create New Design File Dialog box opens. The first step is to select a seed file.



5. Navigate to the desired directory where you want the file placed.
6. Enter the file name you have chosen.
7. Click Open and the file will open automatically.



LAB 2

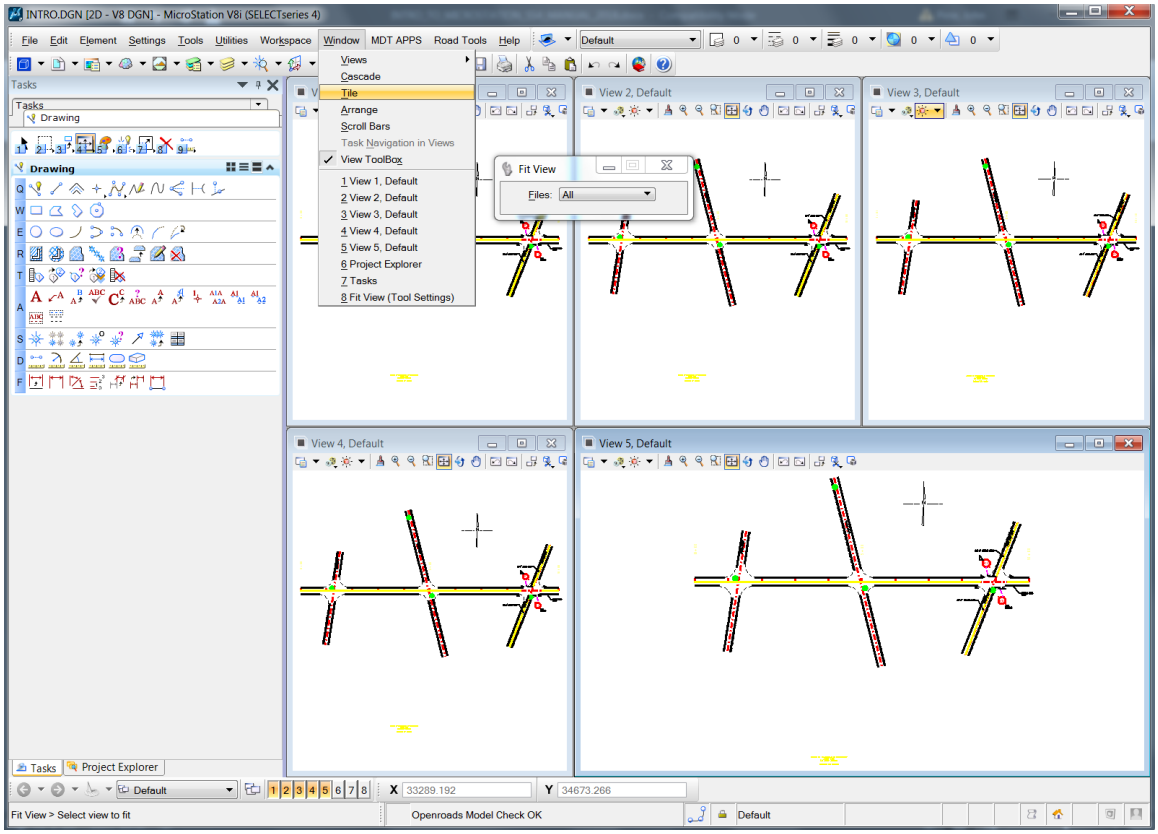
VIEW CONTROL EXERCISE

Objective: Demonstrate comprehension of using MicroStation view controls by arranging five open windows to match given criteria.

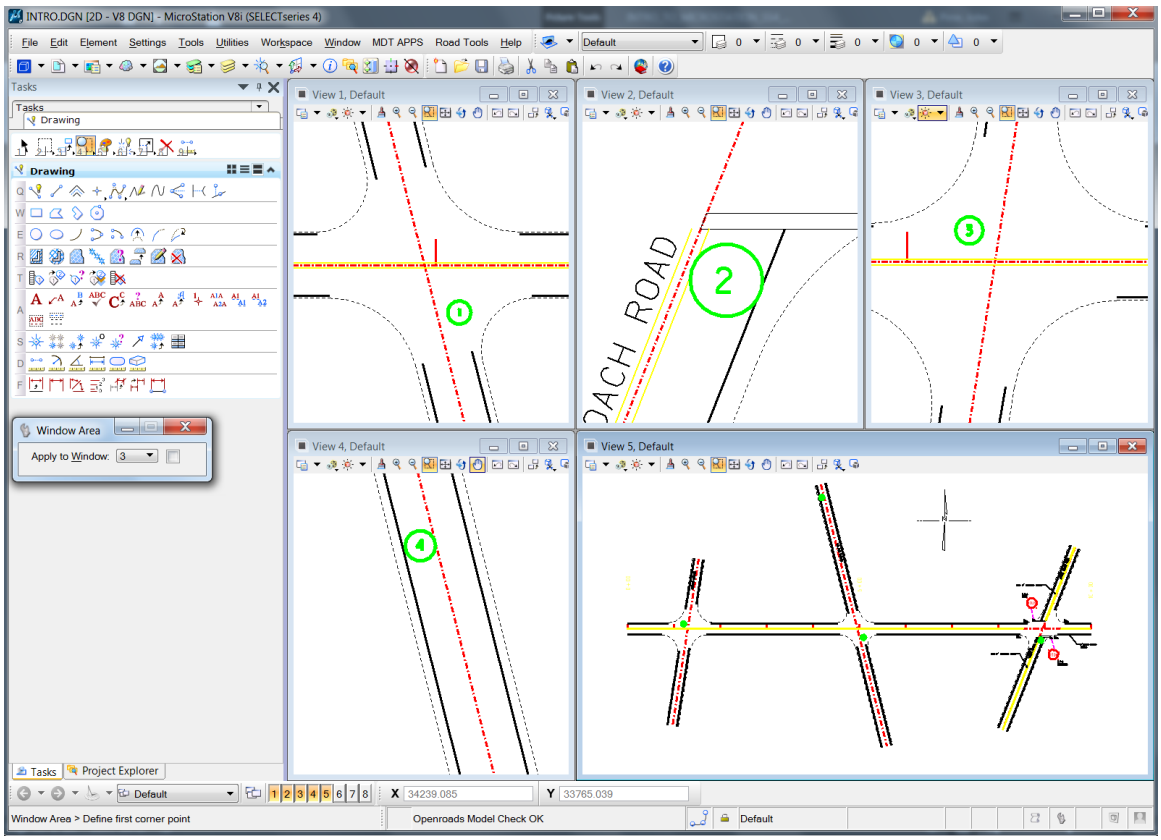
This exercise is completed using c:\dgn\intro.dgn

In this file you will find a map of a road with several intersections. On the map there are small green circles with a number inside each circle. Your task is to arrange the widows so the corresponding number in the circle is in window with the same number. (Window 1 displays the circle with number 1).

1. Open INTRO.DGN and arrange the five windows in the displayed pattern.



2. Using a variety of window manipulations, place the following views in the corresponding window.



Note: Saving settings retains the desired views.

LAB 3

BASIC ELEMENT PLACEMENT AND MANIPULATION

Objective: Demonstrate comprehension using basic element placement and manipulation commands. Upon successful completion of this exercise, the student will have completed the elementary drawings provided.

1. Open file Lab2.dgn

2. Draw figure 1-Lab 3. Use the PLACE LINE command and the PRIMARY TOOLS menu for different line style and weight. Make the sides 100 feet tall and wide and the angle 110 (160) degrees to the other end. Make it 300 feet long.

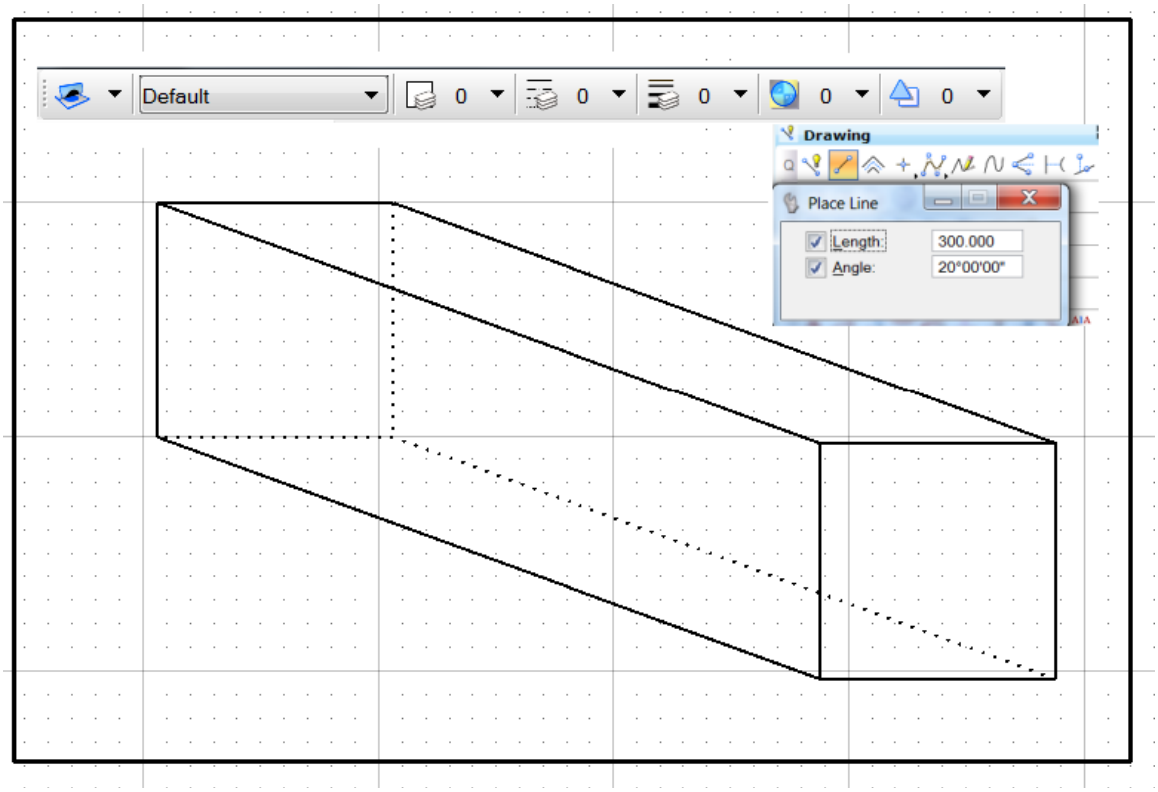


Figure 1-Lab 3

3. Draw figure 2-lab 3. Use PLACE LINE, PLACE CIRCLE, COPY ELEMENT commands. Use the PRIMARY TOOLS menu for different line style and weight. Make the length of these lines 200 feet long and 100 feet high. Make the circles 100 feet in diameter.

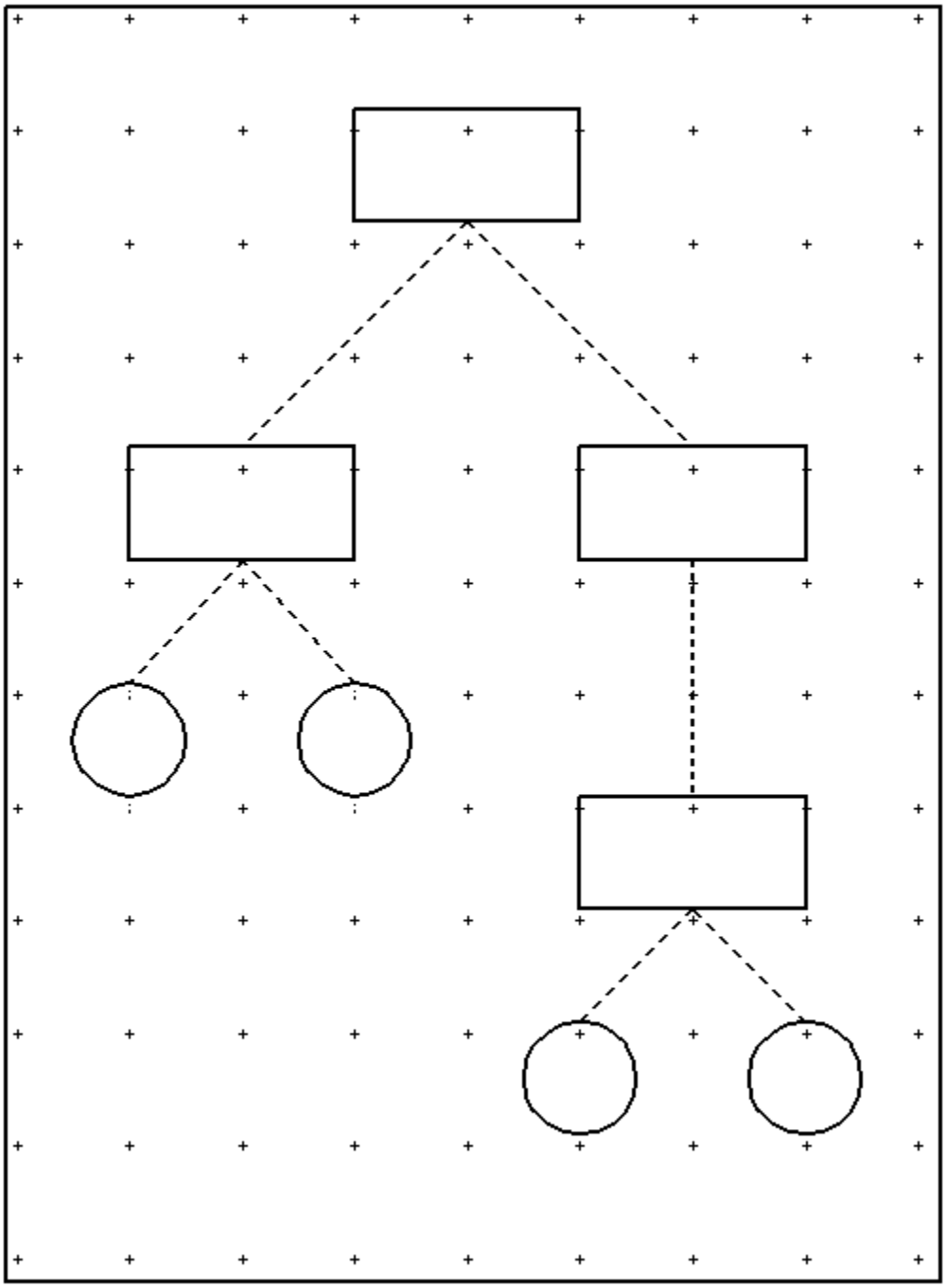


Figure 2-Lab 3

4. Draw figure 3-lab 3. Use PLACE BLOCK, PLACE LINE, and COPY ELEMENT commands. Use the PRIMARY TOOLS menu for different line style and weight. Make these whatever sizes you prefer.

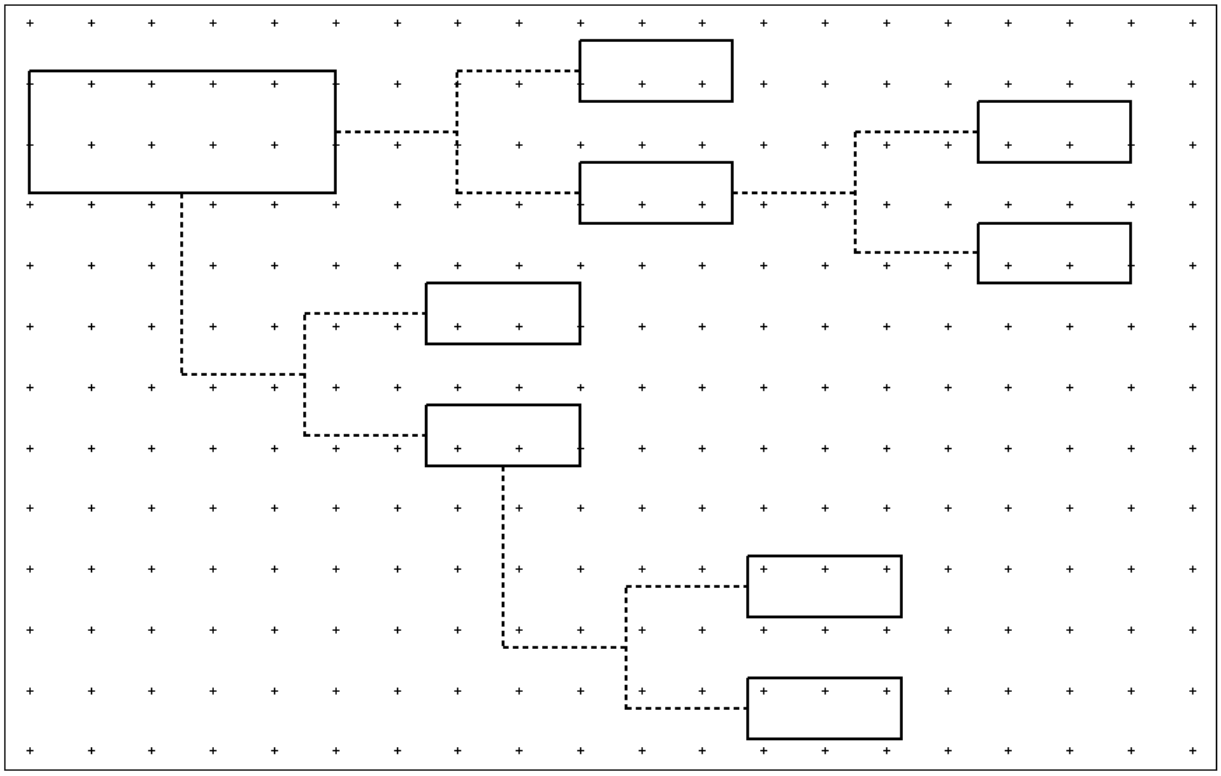


Figure 3-Lab 3

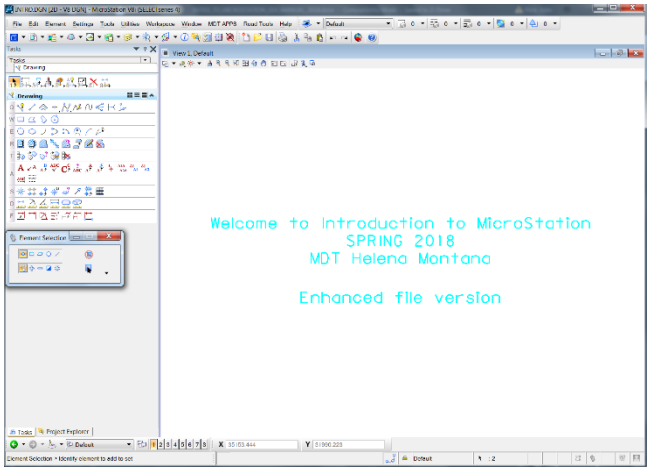
LAB 4

SAVED VIEW EXERCISE

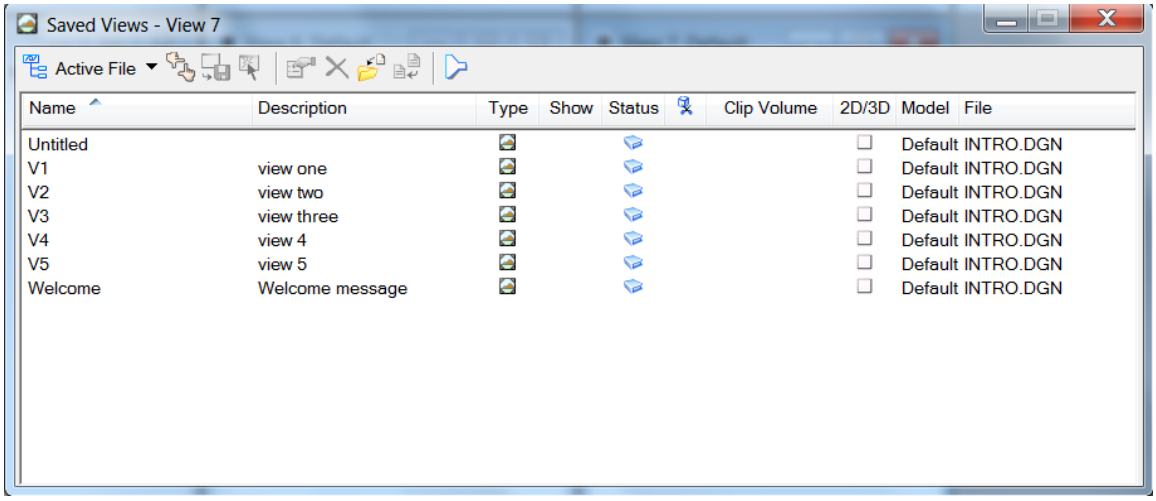
Objective: Demonstrate comprehension of using MicroStation saved view controls by saving six different views which match given criteria.

This exercise is completed using c:\dgn\intro.dgn.
In this file you will find a welcome message and a map of a road with several intersections. On the map there are small green circles with a number inside each circle. Your task is to save individual views of each of these locations, save a view of entire alignment, and save a view of the introduction message.

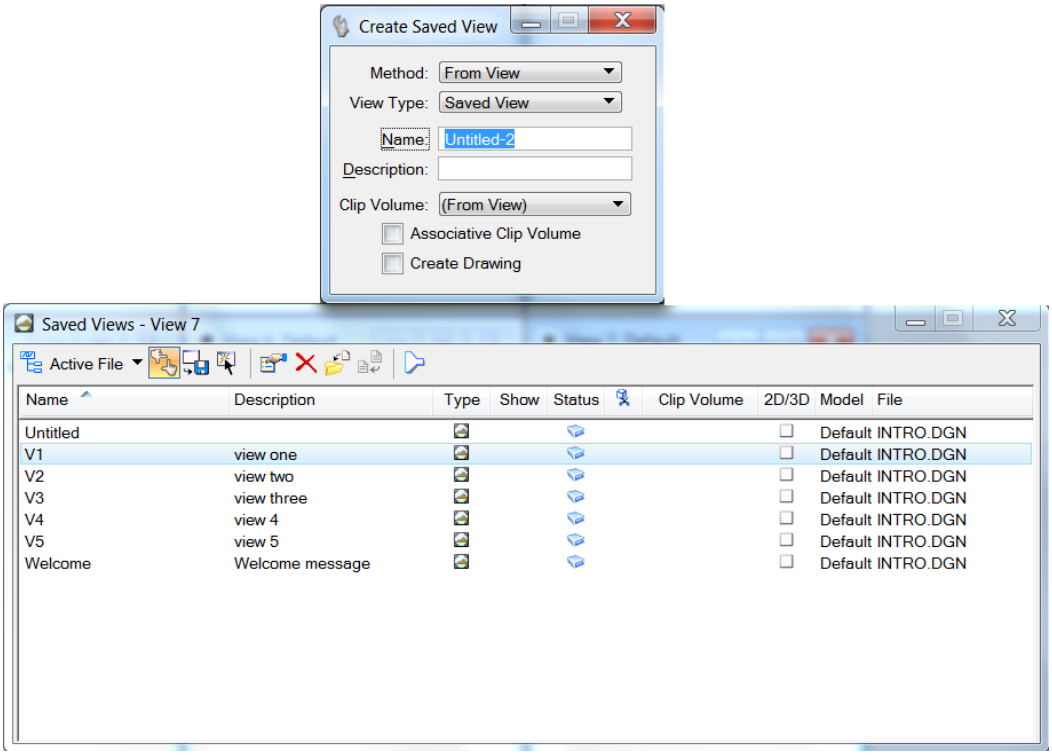
1. Arrange a window, of which you wish to create a saved view.



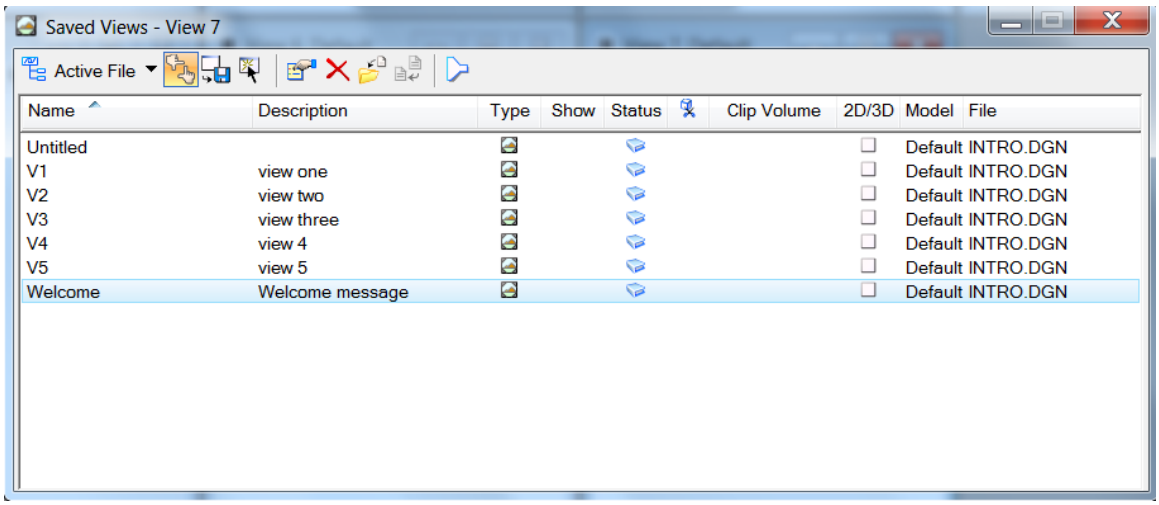
2. Open the Saved View dialog box. Save the view using the proper procedure.



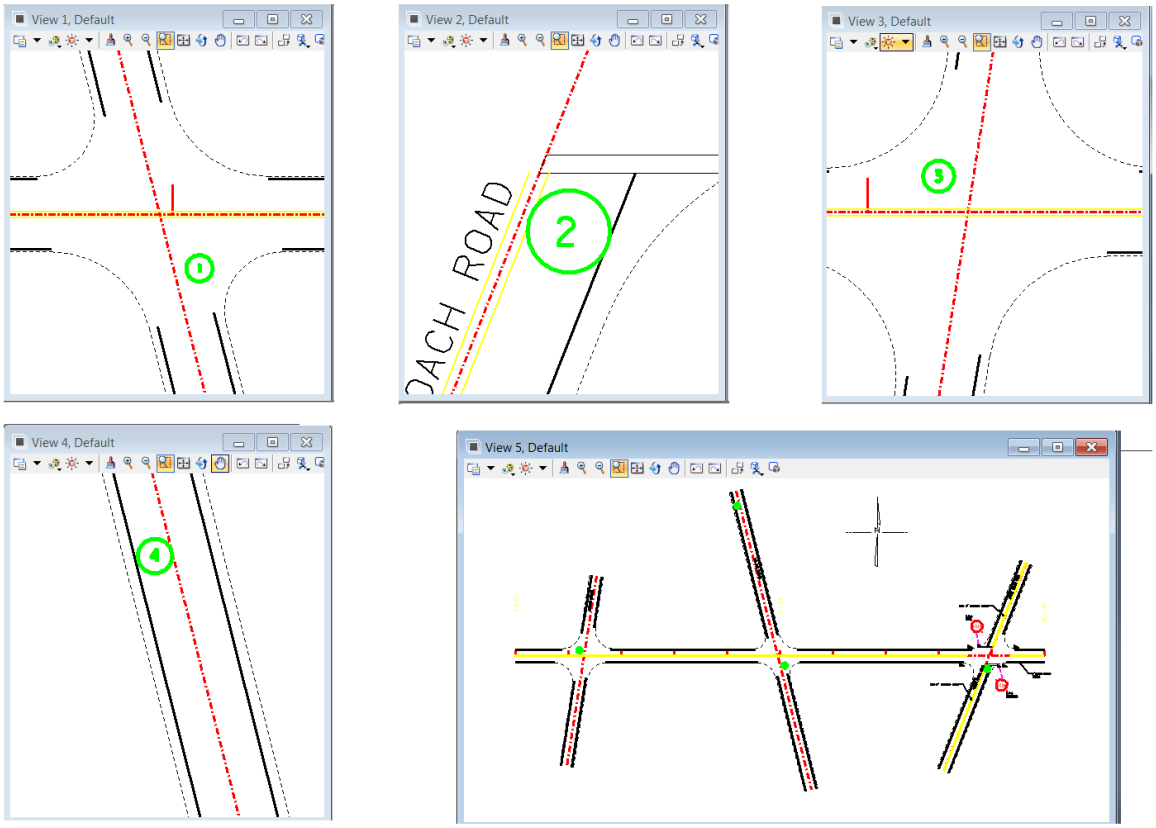
3. **After you key in the Name, Description etc.… select the view you wish the saved view to display on. Continue with the saved view procedure, until you have the five required saved views.**



4. **After saving the five appropriate views, attach the views to different windows by selecting the desired view on the saved view menu then pick the on screen view you wish to assign the view to.**

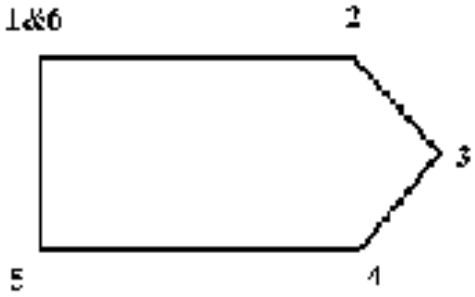


Check for view accuracy then use "save settings" to retain this layout next time you use this file. *File > Save Settings*



LAB 5

Precision input Labs: Use the appropriate MicroStation commands to draw to follow diagrams:



Use Place Line Command

1. XY=10000,10000 or DATA POINT

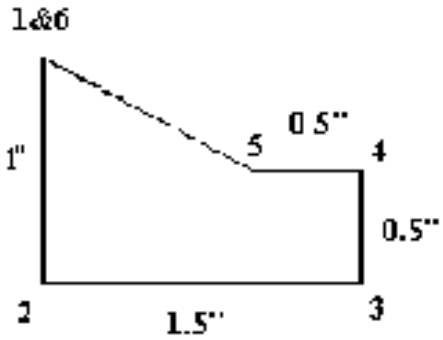
2. DI=1.5,0 or DL=1.5,0

3. DI=.6,-45 or DL=.4243, -.4243

4. DI=.6,225 or DL=-.4243, -.4243

5. DI=1.5,180 or DL=-1.5,0

6. XY=10000,10000 or DI=.85,90 or DL=0,.85 or DATA POINT



Use Place Smart Line Command

1. XY=10000,10000

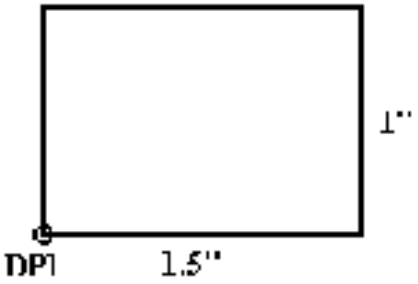
2. DI= or DL=

3. DI= or DL=

4. DI= or DL=

5. DI= or DL=

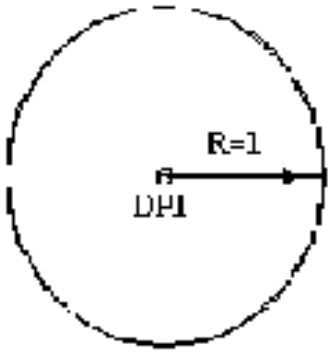
6. DI= or DL=



Use Place Block Command

DI=
Or DL=

Use Place Circle by Center Command



DI=
Or DL=

LAB 6

More Complex Element Placement and Manipulation

Objective: Demonstrate comprehension of using MicroStation commands by completing a more difficult, continuous drawing (in this case, a residential area with surrounding woods and lake), using the commands discussed in the respective lectures.

The drawing is started in this lab; in each subsequent lab exercise, the student will build upon and add to this core drawing until finally completing the project. Thus, the student is able to implement what he has learned in a manner in which practical applications can be seen immediately.

Note: Remember to **SAVE SETTINGS** and **COMPRESS** after each design lab.

The objective of lab 5 is to familiarize the student with the more complex element placement and manipulation commands. Refer Lab 5 illustrations.

Before beginning delete all existing elements out of design file LAB1.DGN.

1. Use place line command to make the Line 1030 Feet Long at an angle of 0 degrees. (See Figure 1-Lab 6)

   A. **Zoom out** until You See the Entire Line.

   B. Set Your **Snap Mode** to Midpoint or choose Midpoint on Snap Button Bar.

   C. Turn on **Snap Lock**.

2. Set Angle = 90 Degrees (AA=key-in).

   A. Use the **Rotate Copy** Command to Rotate the 1030 Foot-long Line Drawn at 90 Degrees about its Center, Tentative Snap to the Center of the Original Line for the Second Data Point. (See Figure 1-Lab 6)

   B. Set Your Angle Back to 0 Degree.

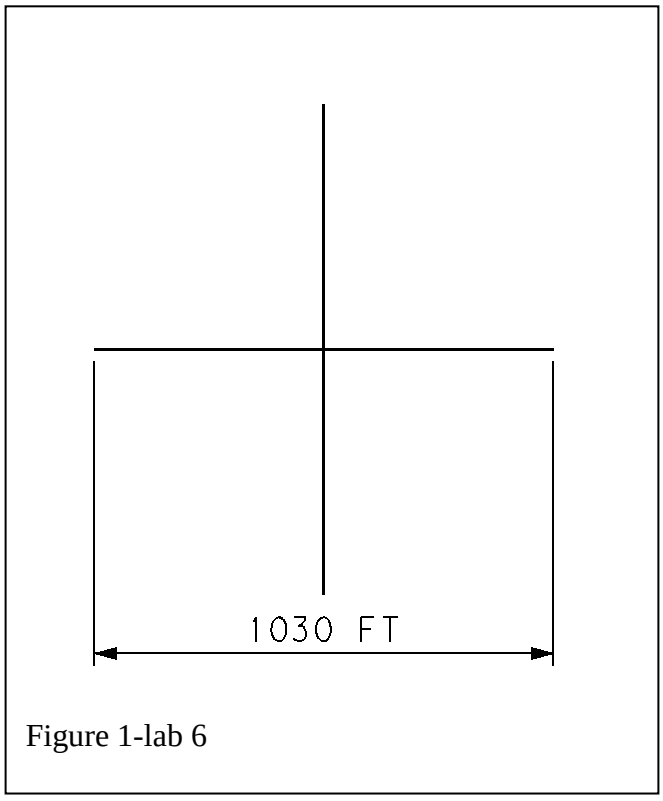


Figure 1-lab 6

4. Use **COPY PARALLEL** command to create the 2 intersecting lines to create the streets.
(See Figure 2-Lab 6)

   A. Turn distance toggle on.

   B. Keyin distance = 15

   C. Place a copy on each side of line

5. **PARTIAL DELETE** the copied lines as shown in Figure 3-lab 6, then **EXTEND LINES TO INTERSECTION.**

6. Place curbs using **CONSTRUCT CIRCULAR FILLET** command with the truncate set to both and radius = 35 (See Figure 4-lab 6).

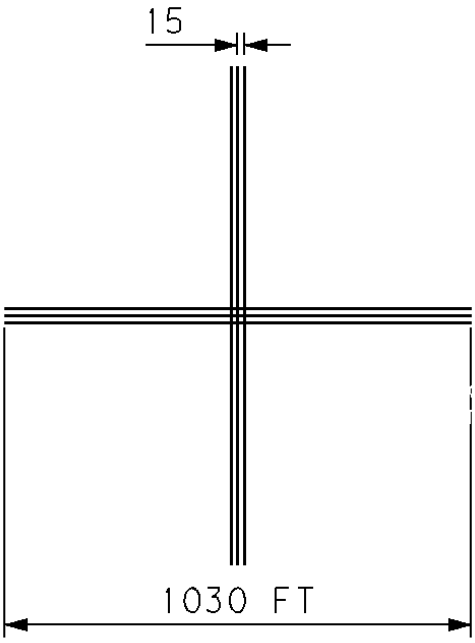


Figure 2-lab 6

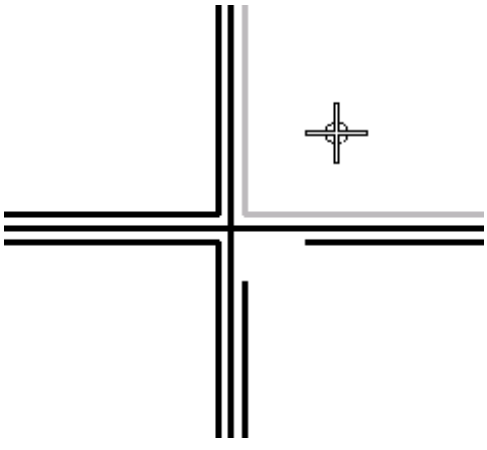


Figure 3-lab 6

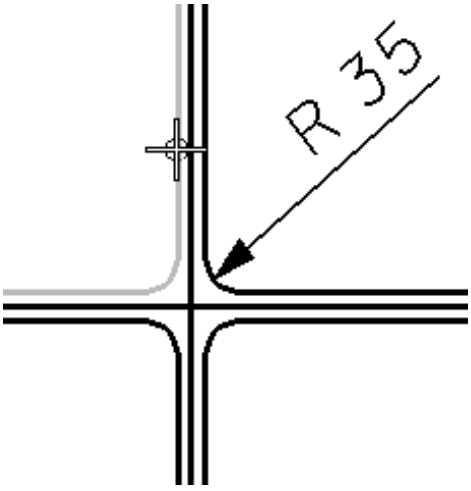


Figure 4-lab 6

7. Use **CHANGE ELEMENT** command to change centerline to style=4, weight = 1, color=4

8. Use **EXTEND LINE** command with a negative value to decrease length of vertical line only, by 250 feet (See Figure 5-lab 6).

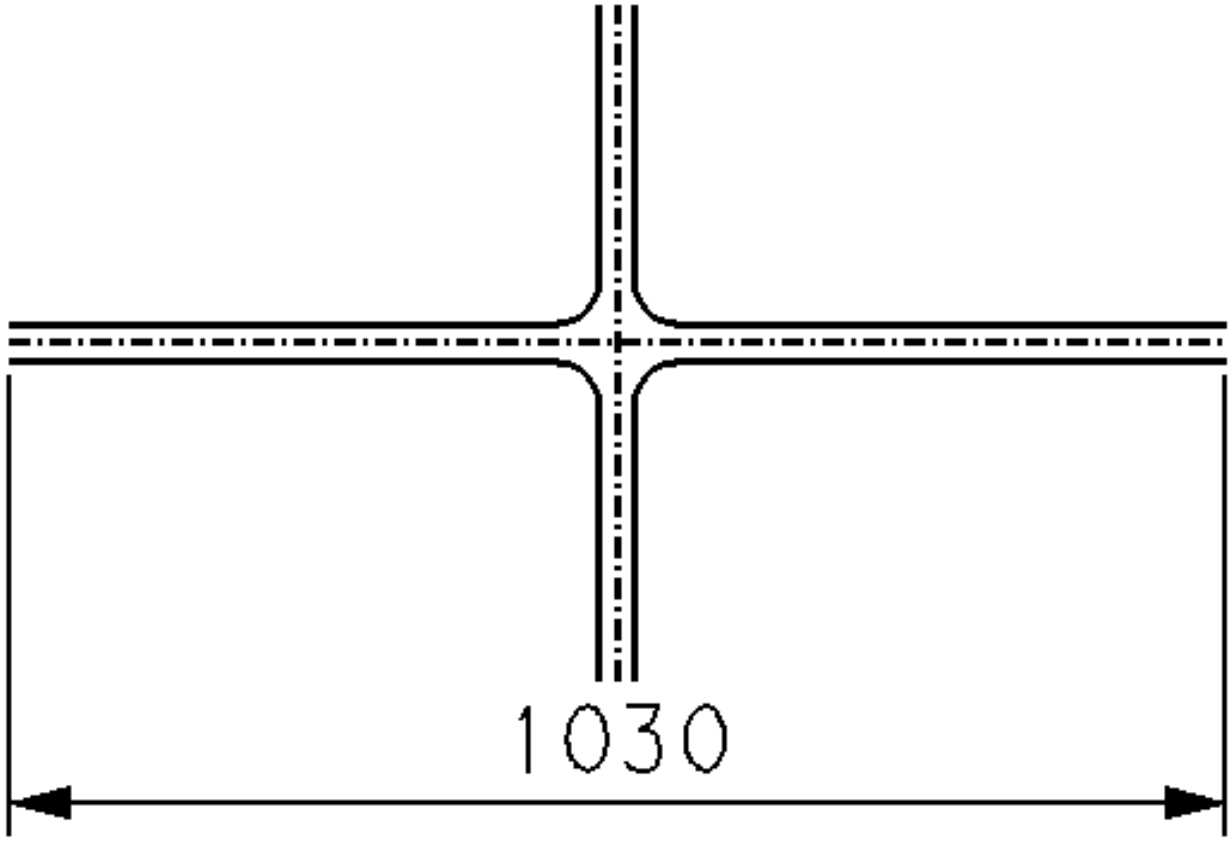


Figure 5-lab 6

LAB 7

HOUSE CREATION

Objective: In Lab 7 the student will create elements for addition to the core drawing started in Lab 6. The particular commands covered in this lesson and preceding lessons will be used. In another area of your design file, draw the house and telephone pole as shown in Figure 1-lab 7.

1. First draw the house outline and roof.

   A. **PLACE LINE** using toggles in the dialog box. Make the first line 50 ft long at 0 degrees.

   B. **ZOOM** until you see the entire line

   C. Use the **COPY PARALLEL** command to copy the line 20 ft and 25 ft above the original line.

   D. Select the **PLACE LINE** command and use tentative to draw the 2 vertical walls.

   E. Use **EXTEND LINE** command to extend both ends of the line you copied at 20 ft by 3 ft.

   F. Select **PLACE LINE** command to connect each end of the extended line to connect with the upper line to complete the roof

2. Next, draw the door.

   A. Select **CONSTRUCT LINE BISECTOR** command and identify the bottom line with a data point. Keyin DI = 8,90. This will draw the middle of the door exactly 8 feet tall. MDT Custom menu

   B. **COPY PARALLEL** this bisector line 3 feet away on each side.

   C. Use **PLACE LINE** command to draw the top line of the door. (Make sure to use tentative to snap to the ends of the line.)

   D. Select **ARC BY CENTER** to place the arc on the top of the door. Snap to the 3 vertical lines of the door from right to left because the arc is drawn counterclockwise.

E. For the doorknobs, select **CIRCLE BY RADIUS** and keyin a radius of 2 inches (:2). Tentative to the bottom of the original bisector. **Note: do not enter a data point yet.** Keyin DL=.3,4. This will draw the right doorknob, then key in DI=.6,180 to draw the other doorknob, or **MIRROR** a copy about the vertical axis of the bisector line.

3. Now draw the windows.

A. To draw the left window, first select the **PLACE LINE** command with a length of 9 and angle of 90. Then TENTATIVE to the lower-left corner of the house. (**Again, do not enter a data point here**.) Key in DL=11,4. This should draw a vertical line that represents the center of the window.

B. Use **COPY PARALLEL**, key-in 2 feet, and place a line on each side of vertical line drawn for each side of the window.

C. Select **PLACE LINE** command and using TENTATIVE, draw the top and bottom of the window.

D. Use the **COPY PARALLEL** command and key in 3 feet to copy the top or bottom of the window to complete the window panes. Your left window should look similar to the one in Figure 3.

E. The right window will be a mirror image of the left window. Place a fence around the entire left window and then select **MIRROR** COPY, VERTICAL, using the original bisector of the door for the vertical line. (Make sure you turn on FENCE toggle)

4. Next, construct the chimney 3 feet from the left edge of the roof.

A. Select the **SMART LINE** command and then snap to the upper-left corner of the roof **(do not place data point yet).**

B. Key in 3 ft in x direction (this will place your first data point), then 3 ft in the y direction, then 3 ft in the -x direction, then 3 ft in the -y direction or keyin:

DL=3,0

DI=3,90

DI=3,0

DI=3,270

and press the reset button. This will complete construction of the house.

5. Last, construct the 75-foot telephone pole with the **PLACE LINE** command.

   A. Select **PLACE LINE**, then TENTATIVE to the lower-right corner of the house. (**Do not enter a data point here.)**

   B. Key in DI=25,0 (this will place your first data point). Draw a 75-foot vertical line.

   C. TENTATIVE to the top of the pole while still in the **PLACE LINE** command. (**Do not enter a data point**.) Key in DL=-3,0. Draw a 6-foot line centered about the vertical line.

   D. Copy this top line down 10 feet with the **COPY PARALLEL** command.

   E. Extend the lower line 3 feet on each end with the **EXTEND LINE** command.

NOTE: Other methods can be used for this drawing, however this step by step procedure covers all the commands presented in the lecture. The telephone Pole in Figure 1-lab 7 is not to scale.

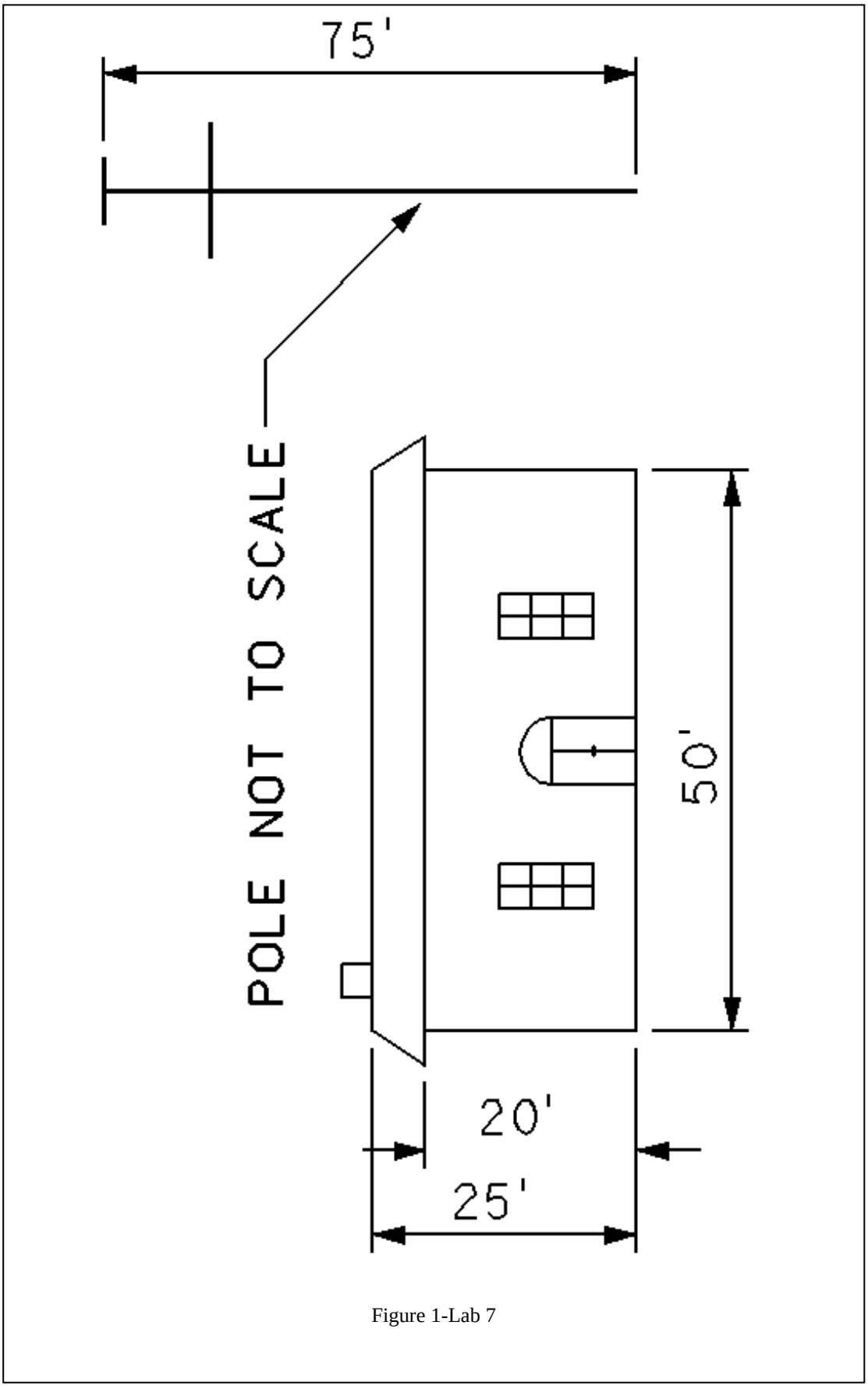


Figure 1-Lab 7

LAB 8

USING FENCES

In Lab 8 the student will continue with the core drawing started in Lab 6. The particular commands covered in this lesson and preceding lessons will be used.
The objective of Lab 8 is to manipulate elements using fences. It also reinforces the material of the previous lecture concerning levels and grid manipulation. Refer to figure 1-lab 8 for the exercise illustrations.

ELEMENT MANIPULATION

1. Change your grid using grid setting box from settings menu. Set your master grid to 10 and reference grid to 12. (You will need to save setting so that you will not lose the grid setting after exiting the file)

2. Create the blocks as shown in Figure 1, Illustration 1. There are two ways to do this. One way is as follows:

    a. Place a fence around the street you previously created and change Fence Mode to Inside.
    b. Select **MIRROR** with Copy on, Mode Horizontal, Fence toggled on; snap to the end of the one of the vertical center lines and mirror the contents.
    c. Place a fence to include the newly mirrored elements.
    d. Continue to mirror the streets until your image looks like the one in Figure 1-Lab 8, Illustration 1.

3. Draw a lake in the middle block of the streets using the **PLACE POINT CURVE** command.

4. Be sure to turn your fast curve display off so you can see the curve string. This will now look like Figure 1-Lab 8, Illustration 1.

5. You are now preparing to move the center lines to another level. Make a graphic group out of the center line, using the **GRAPHIC GROUP ADD** command.

6. Change your active level to three (LV=3).

7. Select **CHANGE ELEMENT** command and select an element from the graphic group. (Make sure your graphic group lock is toggled on.)

8. Change your active level back to level 1 (LV=1).

9. Turn off level 3 so you are no longer looking at the center lines in view 1. Your drawing will now look like Figure 1-Lab 8, Illustration 2.

NOTE: Remember to SAVE SETTINGS and COMPRESS after each design session.

Figure 1-Lab 8

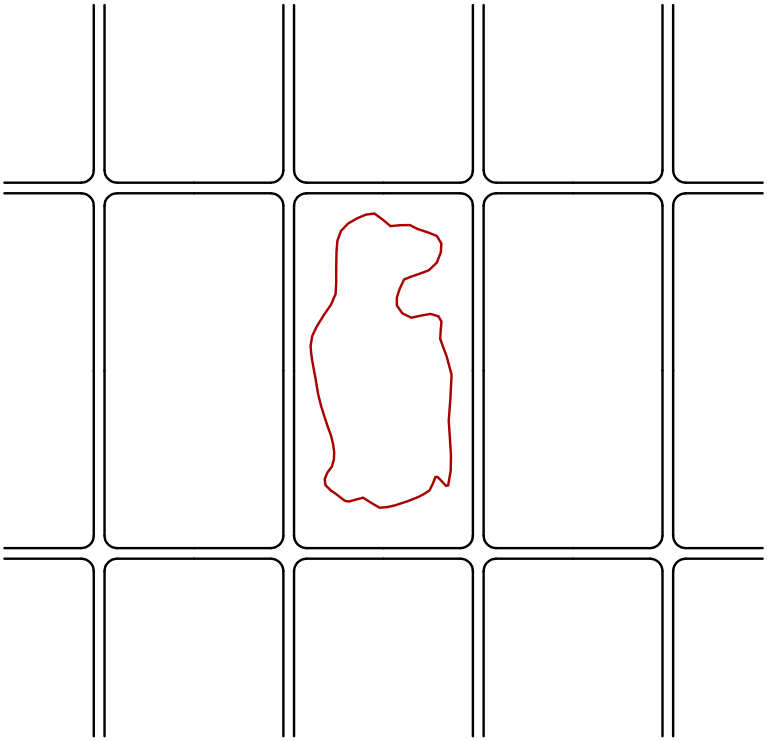


ILLUSTRATION 2

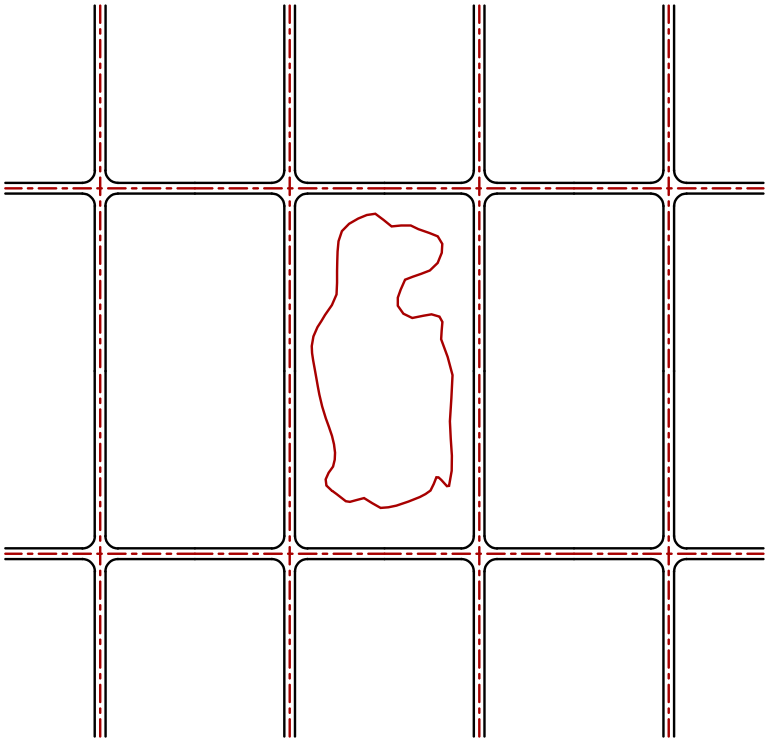


ILLUSTRATION 1

LAB 9

CELL CREATION AND PLACEMENT

Objective: In Lab 9 the student will continue building upon the core drawing of the previous lab sessions. The particular commands covered in this lesson and preceding lessons will be used. The purpose of Lab 9 is to review the cell commands. The student will use the elements drawn in previous lab exercises from which to create cells. New cells will also be drawn in Lab 9. Refer to Figure 1-Lab 9 for the exercise illustrations.

REVIEWING THE CELL COMMANDS

1. Create a cell from the house drawn in the Lab 6 exercise (HINT: Place cell origin on lower left corner)

2. Use **CELL MATRIX** command or **CM=** number of rows, number of columns, distance between rows and distance between columns to place the houses on the streets as shown in Figure 1-lab 9 (2 rows, 10 columns). You need to determine the distance needed between each row and column. Place the cell matrix origin 25 feet from the edge of the street.

   HINT: Use active point for cell matrix origin.

3. Draw a cul-de-sac at the end of one street with a 75-foot radius and 35-foot curb. The steps are as follows:

   a. Extend the center line of the street 75 feet.
   b. Choose the **PLACE ARC** command and key in a radius of 75 feet. On the left side of the drawing TENTATIVE to the end of the lower curb and accept to define the first point, TENTATIVE to the end of the center line and accept to define the center point and TENTATIVE to the end of the upper curb and accept to define the second point
   c. Shorten the line you extended by 75 feet.
   d. Use the **CONSTRUCT CIRCULAR FILLET** command and set truncate to both to place the curbs between the outer lines and arc. Give a radius of 35 feet.

4. Make a cell out of the cul-de-sac. Put the origin at the end of the center line you shortened.

5. Place these cells at the ends of the streets you created. Make two cells larger than the original in different sizes.

6. Use the **DROP ELEMENT** command on the cells and re-fillet them so that the arcs meet the streets (35-foot radius).

NOTE: Remember to **SAVE SETTINGS** and **COMPRESS** after each design session.

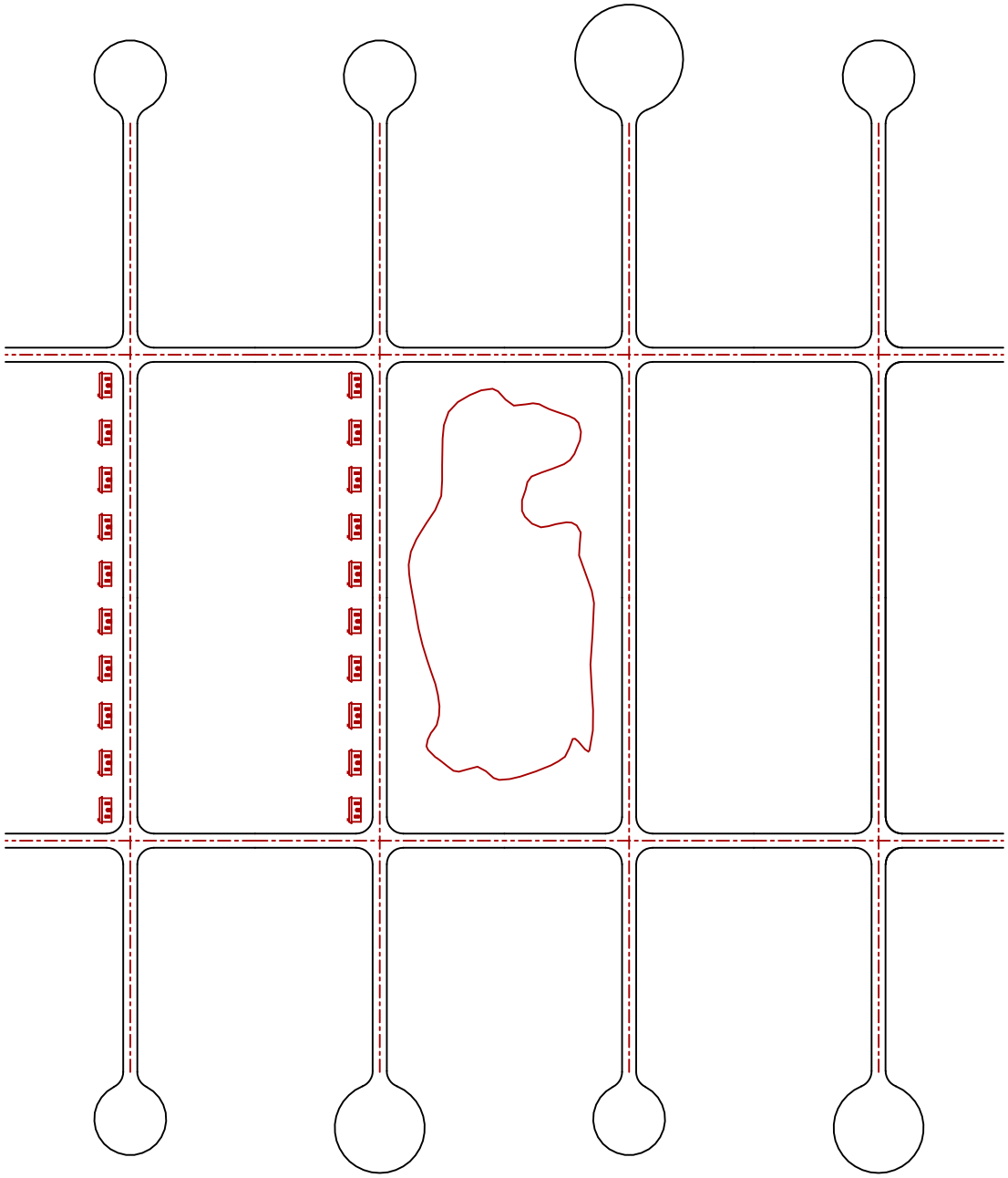


FIGURE 1-LAB 9

LAB 10

CELL MANIPULATION

In Lab 10 the student will continue building upon the core drawing of the previous lab sessions. The particular commands covered in this and preceding Labs will be used.

Lab 10 is a continuation of work with cells (Lab 9). It is also designed to give the student practice in using patterning, active points, and line terminators. Refer to Lab 10 Figures 1, 2, and 3 for the exercise illustrations.

1. Create a cell of the telephone pole called POLE that you created in Lab 7.

2. Create a cell representing a railroad track called RR. (This and the following cells are shown in Figure 1-Lab 10)

3. Using the **PLACE ACTIVE CELL** command, place the cell TREE from the w:\rdstd\survey.cel into your drawing at a scale of 1.0. Use the **DROP ELEMENT** command to drop the cell from a complex element. Use these elements to create a cell called TREE and place in the LABV8.CEL cell library.

4. Create a water cell called WATER using the **PLACE POINT CURVE** command.

5. Create a border cell called BORD.

6. Create a terminator cell called ARROW with the origin at the point.

7. Create a shingle cell called SNGL that is 1 foot long and 6 inches wide (Figure 1-Lab 10.).

8. Draw a curve string in the upper right corner block of your drawing as shown in Figure 2-Lab 10.

   HINT: Leave a gap in the curve string between beginning and end.

9. Draw a **SMART LINE** at the top of your drawing that will later be patterned as a railroad track (Figure 2-Lab 10).

10. Draw a **SMART LINE** at the lower left of your drawing as shown in Figure 2-Lab 8 that will be used as a True North indicator.

11. Turn off level 3 and draw the lines in the street that will point to the lake from the top left cul-de-sac.

12. Draw a border around the drawing (4140 feet wide, 3030 feet high).

13. Place a title block in the bottom right corner of the larger border (850-feet wide and 400-feet high).

14. Use the command **CONSTRUCT ACTIVE POINTS BETWEEN DATA POINTS** to place nine telephone poles beside the houses on both streets.

HINT: Use ACTIVE POINT tool with cell name = Pole (Lecture 5, page 62)

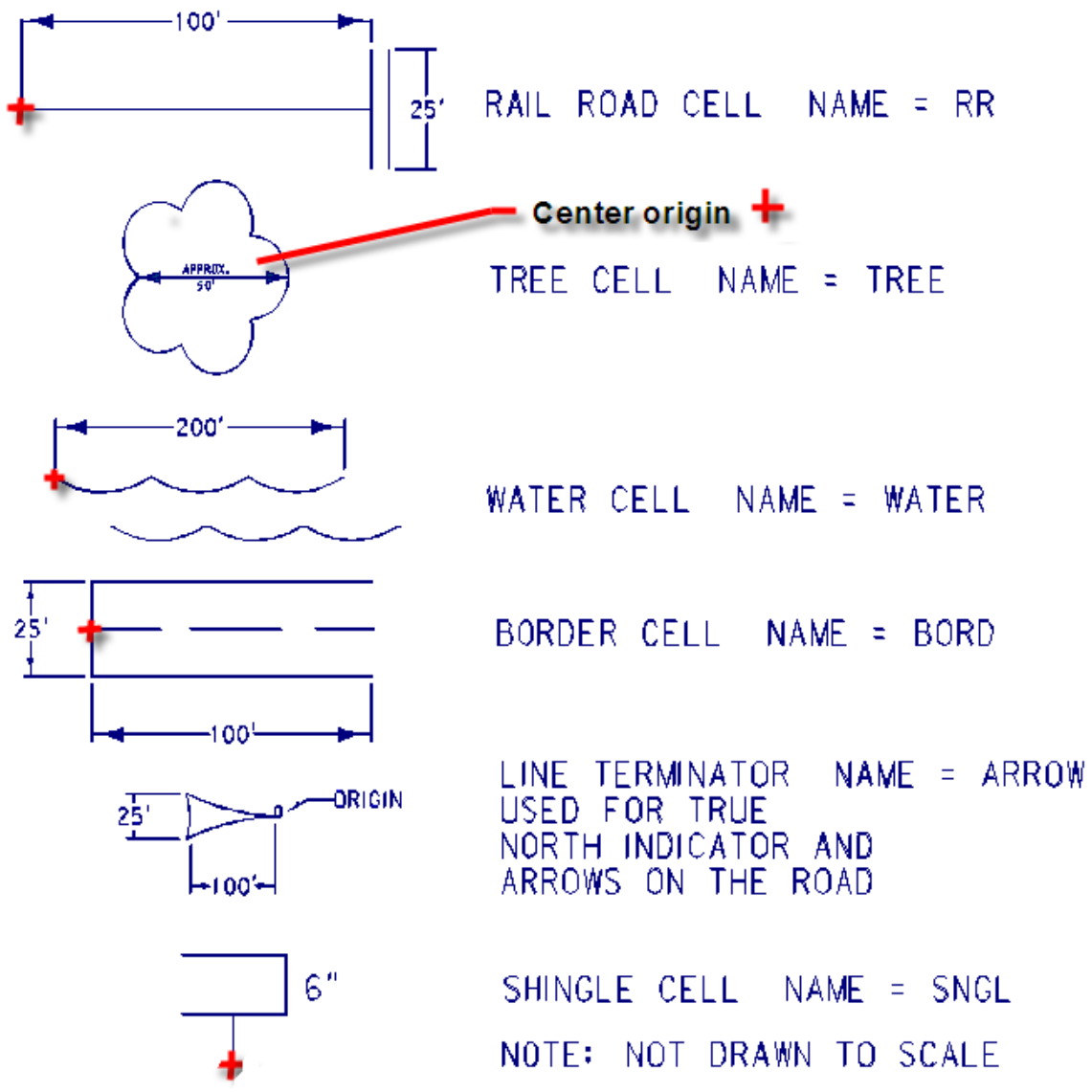
15. Place 29 trees along the curve string in the upper right corner block using the command **CONSTRUCT ACTIVE POINTS ALONG ELEMENT**.

HINT: Use ACTIVE POINT tool with cell name = Tree (Lecture 5 page 5-9)

16. Delete the curve string behind the trees.

NOTE: Remember to **SAVE SETTINGS** and **COMPRESS** after each design session.

FIGURE 1-Lab 10



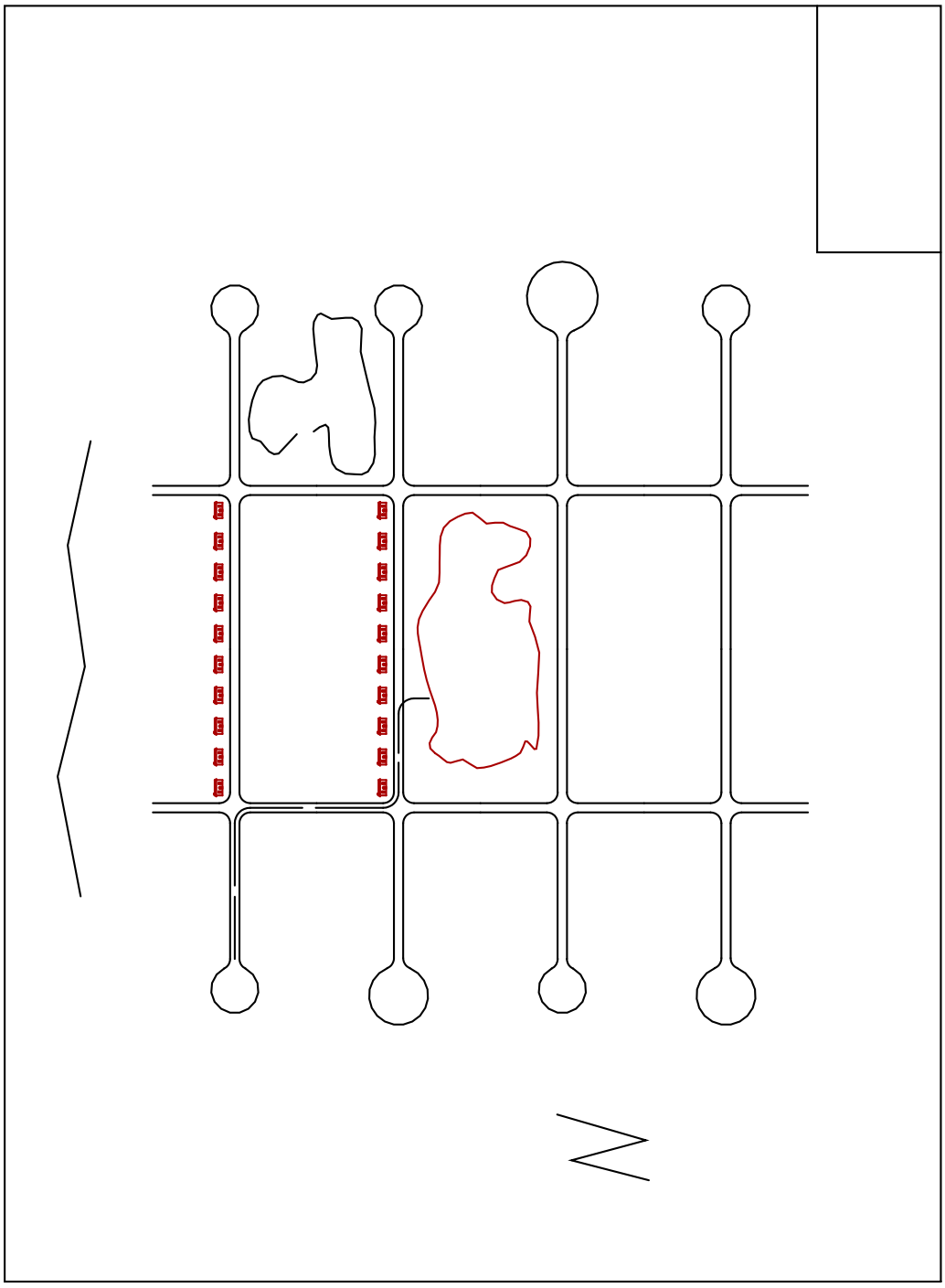


FIGURE 2 - LAB

LAB 11

PATTERN MANIPULATION

1. Use the **TRUNCATED CYCLE LINEAR PATTERN** command to pattern the line string representing the railroad track. (See Figure 1-Lab 11)

2. Make the water cell your active cell (**AC=**cell name). Place several cells inside the lake.

3. Place an arrow at the end of the True North indicator (Cell name = ARROW).

4. Place line terminators on the lines used to indicate the way to the lake.

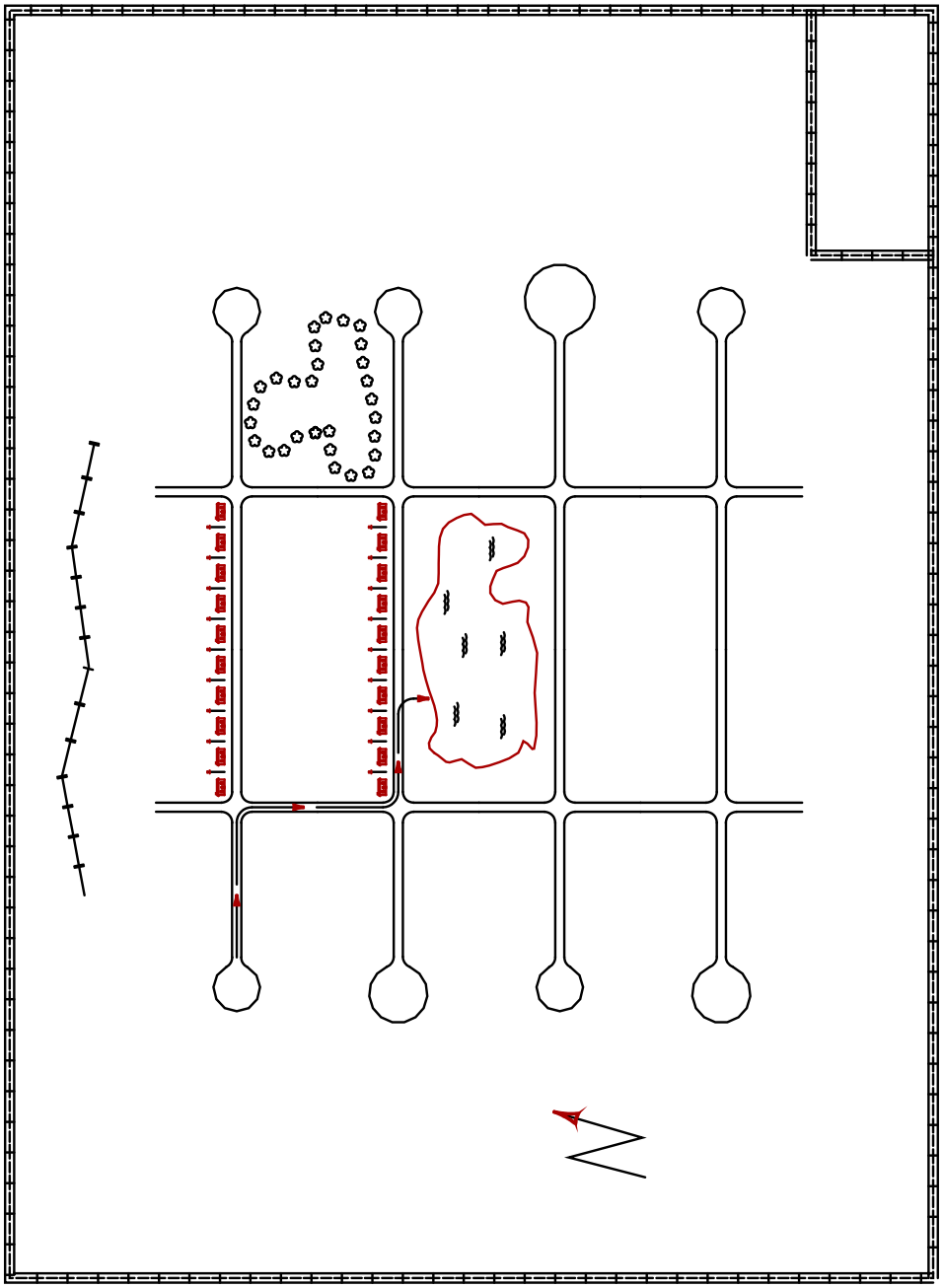
5. Pattern the large border with the border pattern (linear).

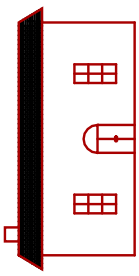
6. Pattern the title block border with the border pattern.

7. Set your active scale to 15 and place a house cell outside your border. Drop status on this house cell.

8. Create a complex shape of the roof of the house. Use the **AREA PATTERN** command to pattern the roof. (HINT: Be sure pattern scale is set to 15) Your drawing should now resemble figure 1-Lab 11.

Figure 1-Lab 11





LAB
L 180

LAB 12

TEXT PLACEMENT

Objective: In Lab 12 the student will continue building upon the core drawing of the previous lab sessions. The particular commands covered in the preceding labs will be used.

Lab 12 covers the majority of the text commands discussed in the lecture on text placement. The purpose of the exercise is to give hands-on practice in the basic material presented during the classroom session. Refer to Figure 1 – Lab 12 for the exercise illustration.

THE TEXT COMMANDS

NOTE: Place all text on level 9.

1. Draw a creek, using the **PLACE POINT CURVE** command below the railroad. **COPY PARALLEL** this line 50 feet. (See Figure 1-Lab 10)

2. Place text naming the creek along a point curve (The name should appear between the two point curves)

3. Key in FT=42. Place text above the lake.

4. Key in FT=23. Place the name BANKHEAD WOODS at the right of the woods.

5. Place your name, the date, and company name (FT=71) in the title block of your drawing.

6. Place THIS WAY TO LAKE (FT=42) as shown in Figure 1-Lab 12.

7. Place TRUE NORTH INDICATOR (FT=42).

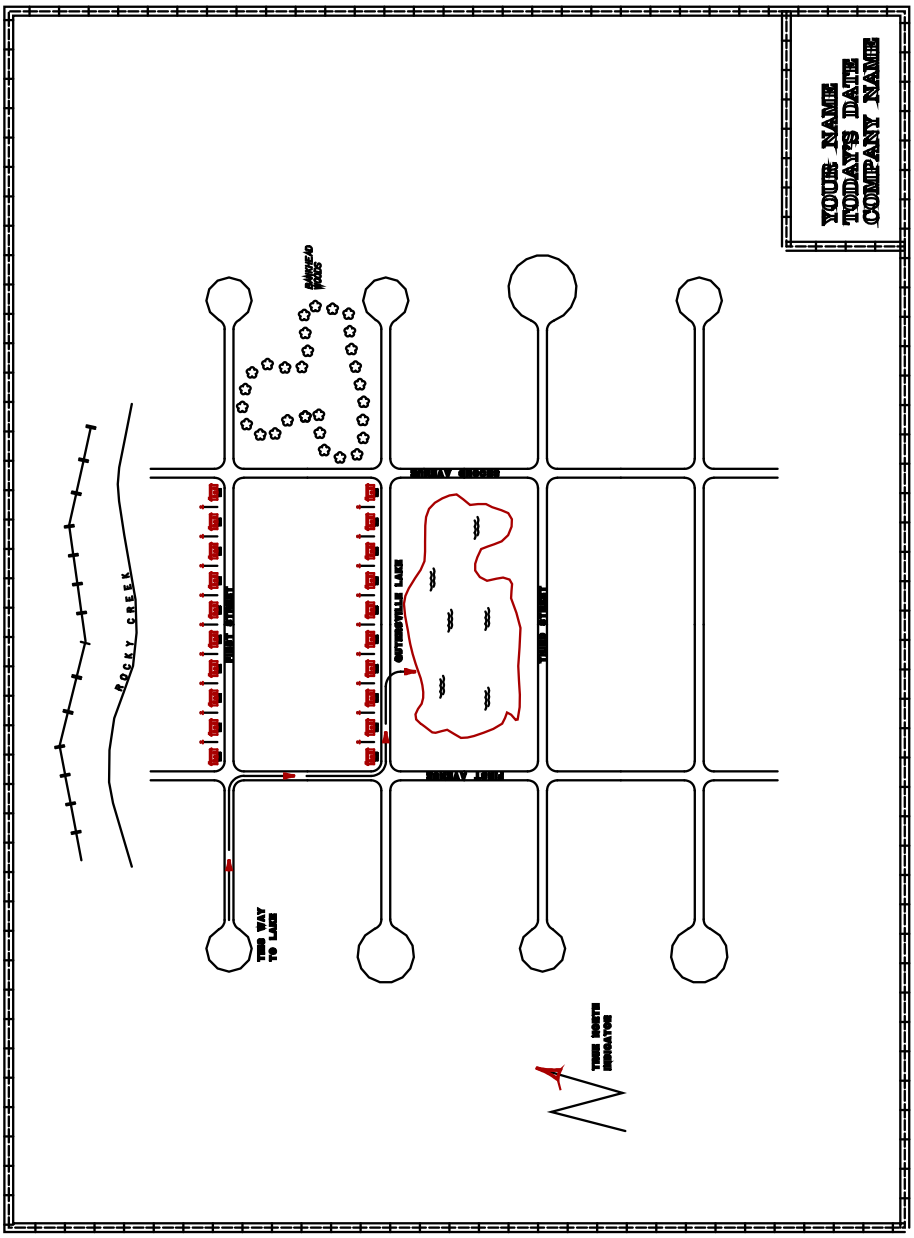
8. Place text above the line to place street names on the streets, using your choice of font.

9. Put numbers on your houses using the following steps:

    a. Place a house cell in your design file (AS=1).
    b. Drop element on the cell.
    c. Add enter data fields below the house. (It will look like figure 2-Lab 12).
    d. Delete the old house cell from your cell library.
    e. Name a new house cell the same as the house you just deleted.
    f. Use the **REPLACE CELL** command and replace the old houses with the new ones. Now place numbers in the enter data fields using **ENTER DATA SINGULAR** and **COPY AND INCREMENT** the enter data fields. (See Figure 3-Lab 12)

NOTE: Remember to **SAVE SETTINGS** and **COMPRESS** after each design session

Figure 1-Lab 12



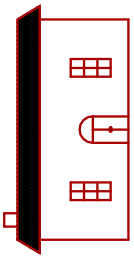
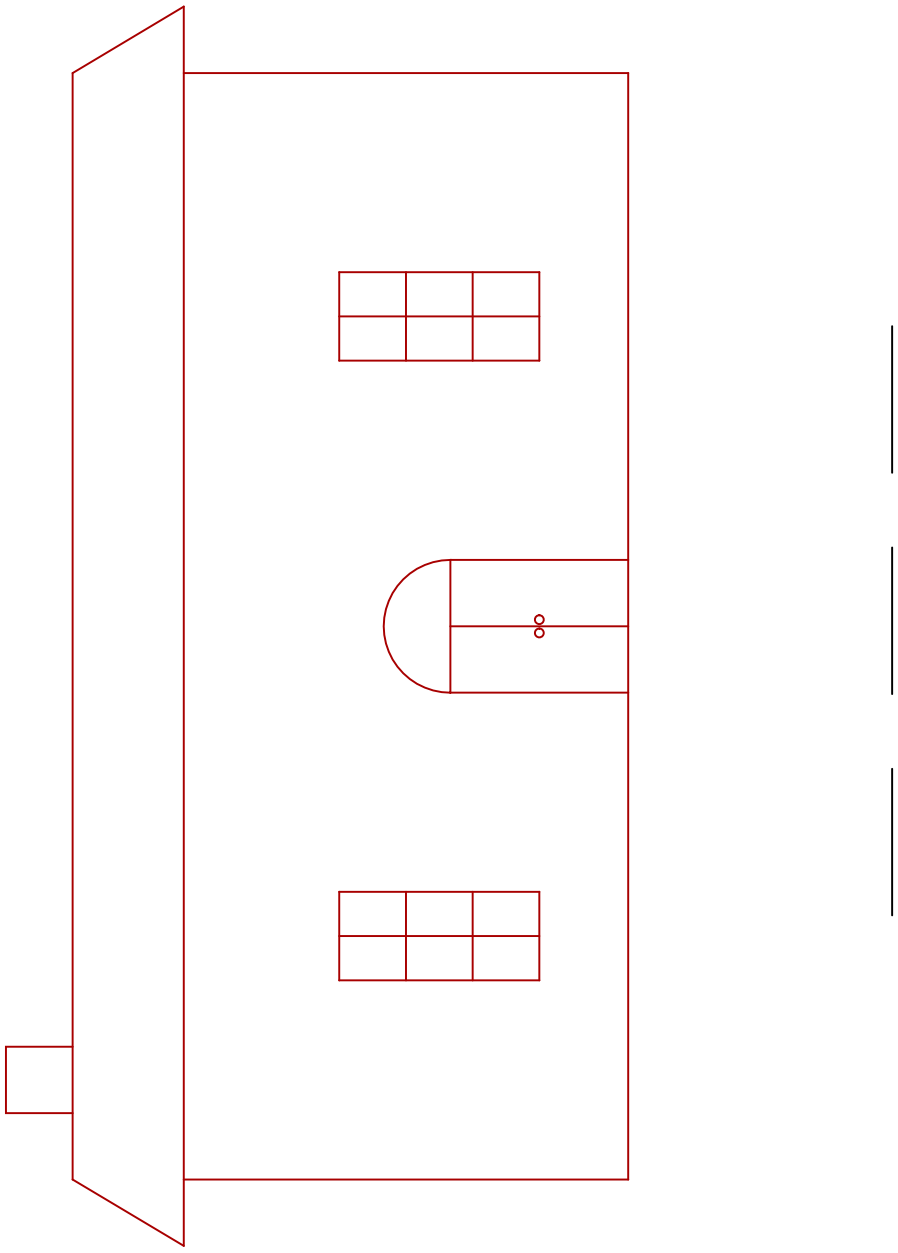
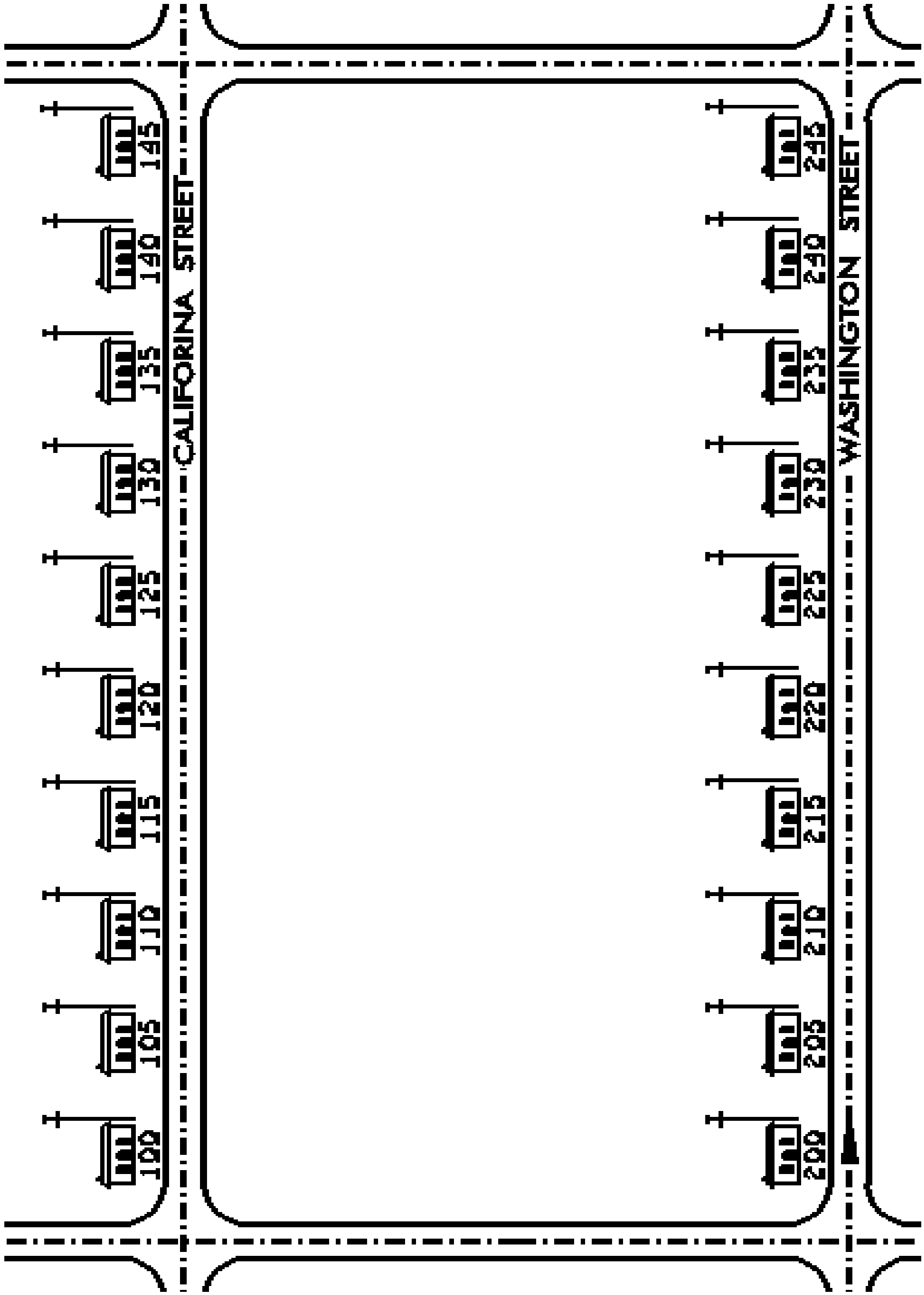
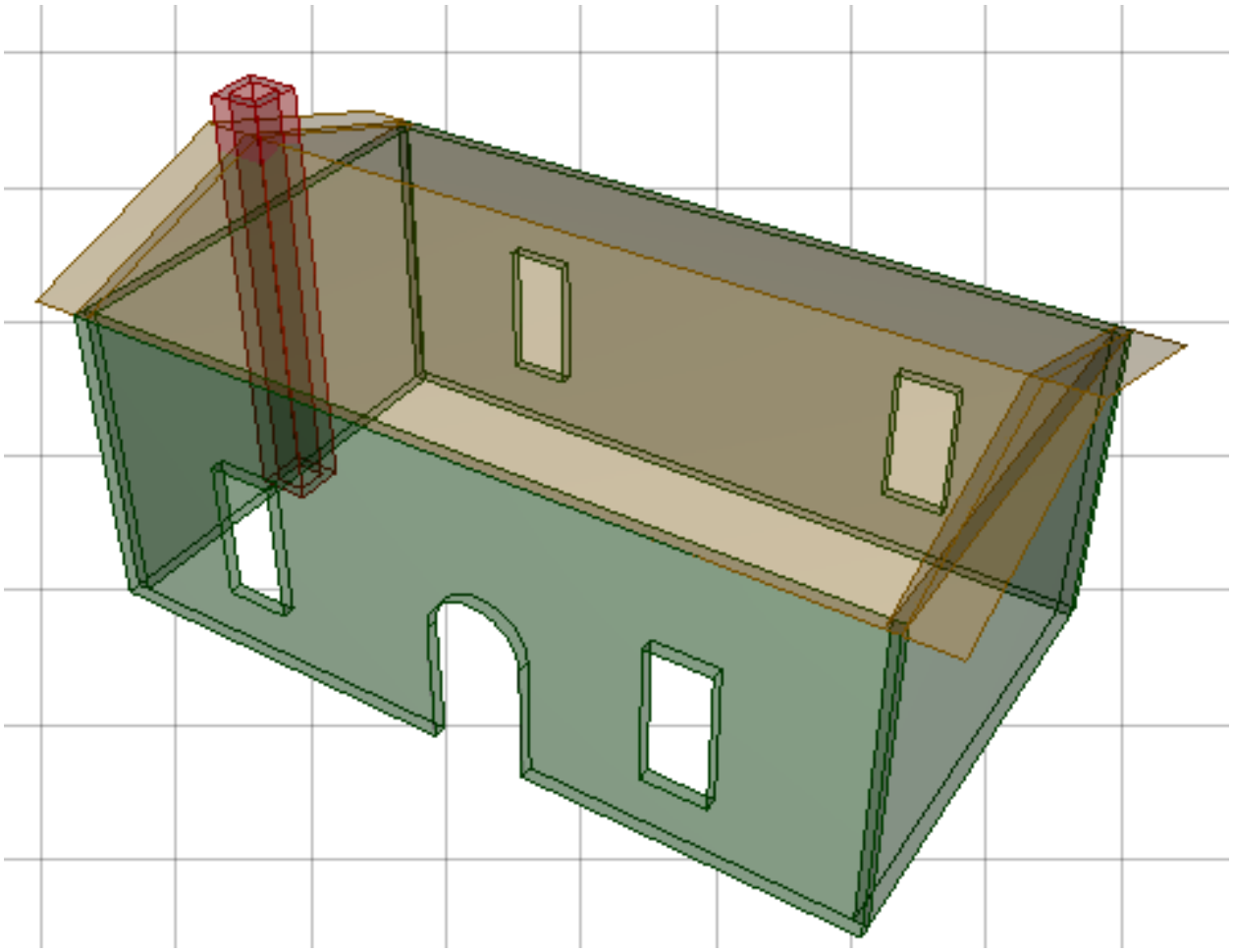


FIGURE 2-LAB 12



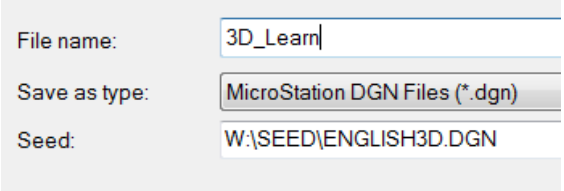
LAB
L 183


CALIFORINA STREET
WASHINGTON STREET
100
105
110
115
120
125
130
135
140
145
200
205
210
215
220
225
230
235
240
245



MDT Basic MicroStation 3D drawing and model manipulation exercise. (You probably recall this building from the MDT Introduction to MicroStation manual it was placed and drawn in 2D on the road side of your plan). REV: 4

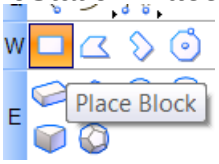
1) As reviewed earlier in this manual (MDT Introduction to MicroStation manual) create a new file utilizing MDT “MDT-Seed3D-Imperial.dgn” seed file.



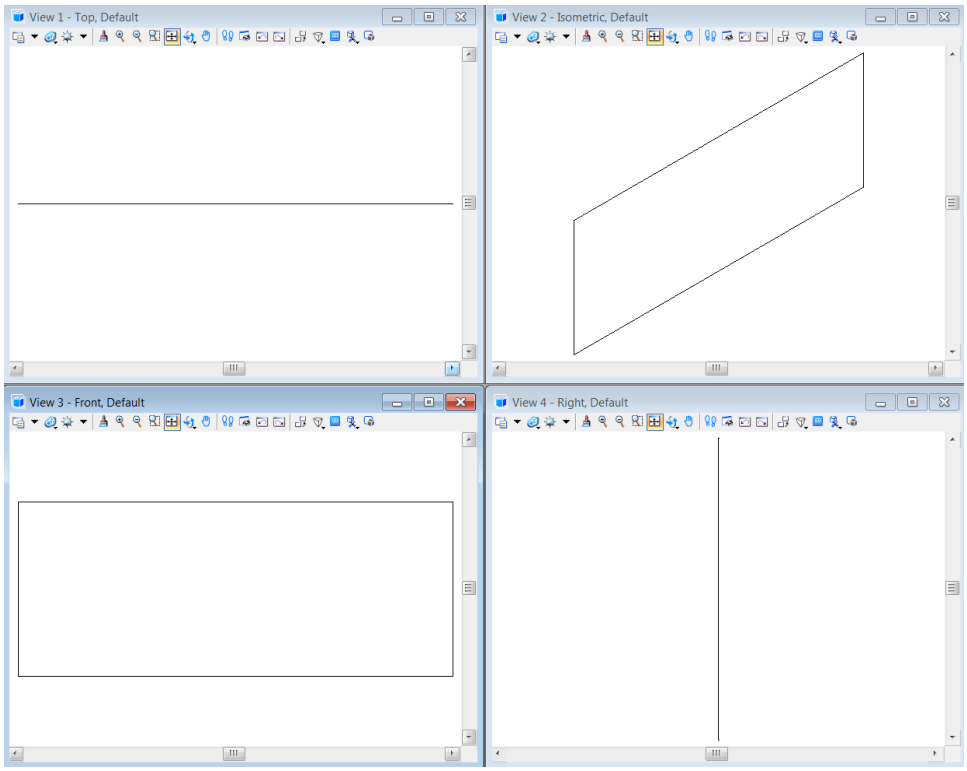
1) Open your first 4 views using view control at the bottom of your screen.

Then select the pull-down Menu ***Window*** > ***Tile*** to fit all 4 views to your screen.

2) In the **Front** view draw a rectangle 50 X 20 using the MicroStation ***Place Block*** command to construct the front wall of the house.



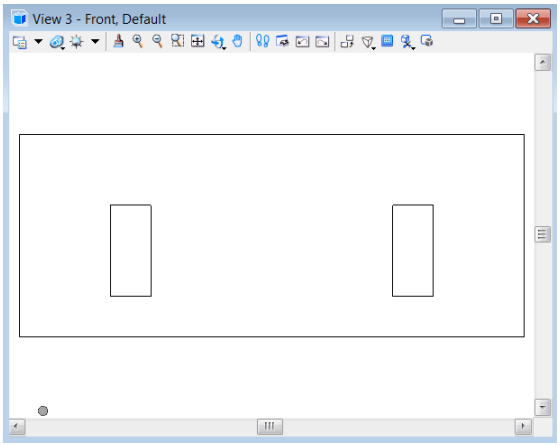
This is the objective:



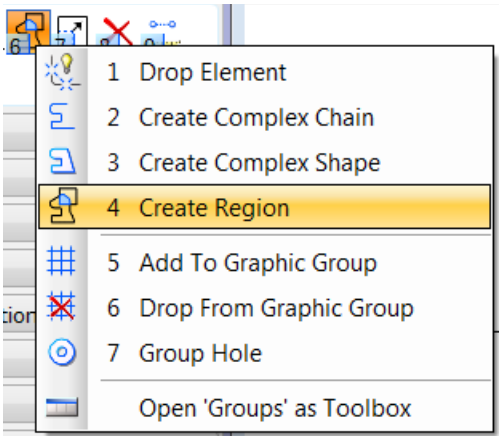
3) Again, use the ***Place Block*** command to construct your first window by using tentative (not data point) to the lower left corner of the wall, then key in DX=9,4 to locate and begin the lower left corner of the window. Draw a 9 X 4 block. You will draw a door later.

Use the **Mirror** command to mirror your window about the mid-point of the wall

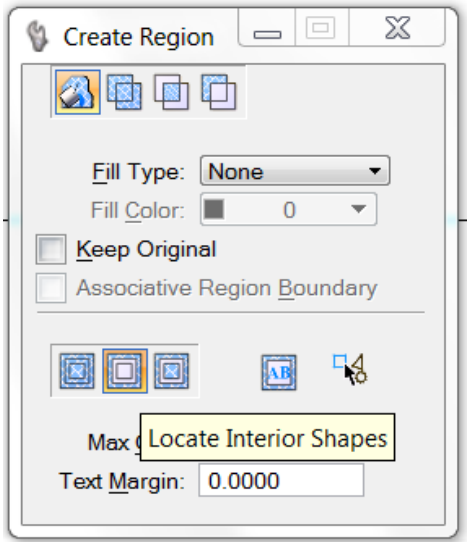
As showed:



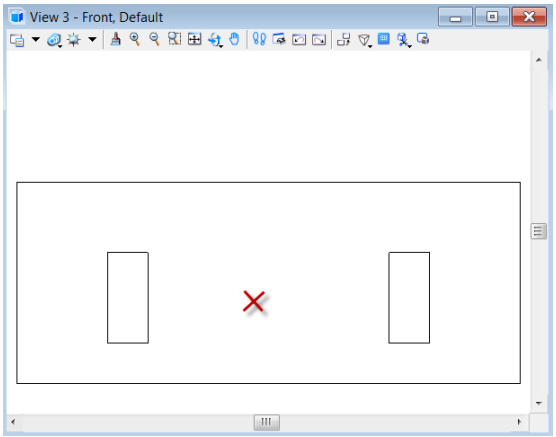
4) Select the **create region** tool:



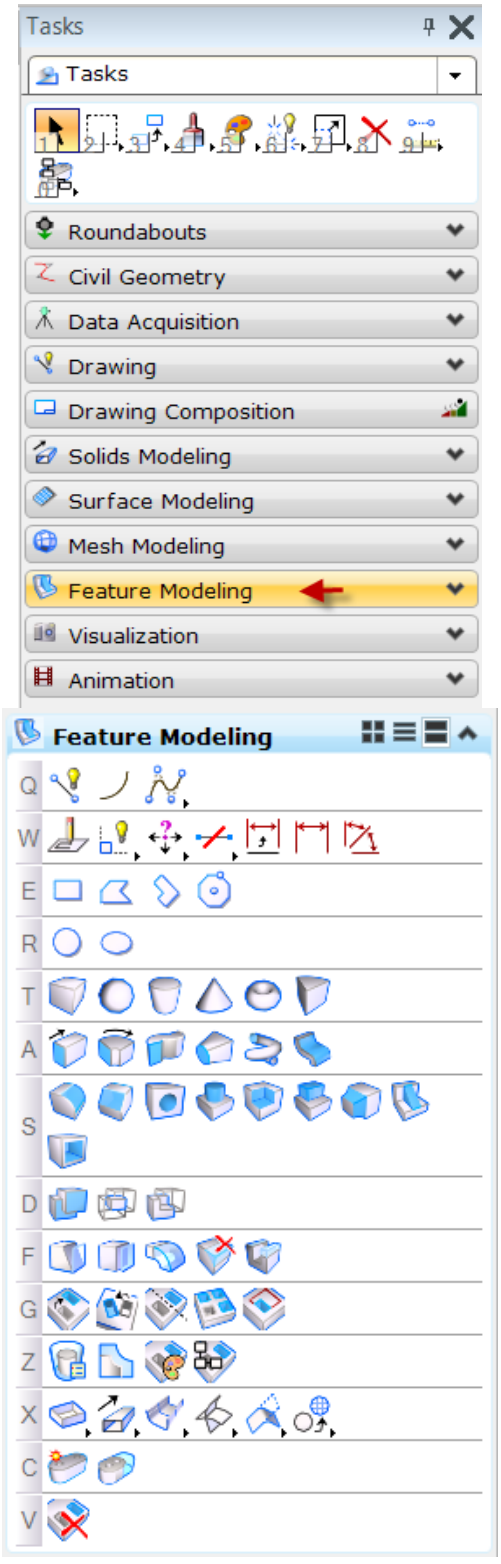
Set it to **Flood** and **Locate Interior shapes**:



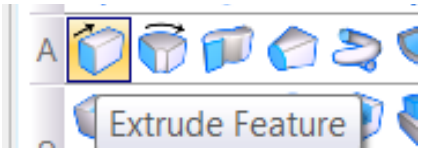
Select the inside of the wall to create a region of your wall:



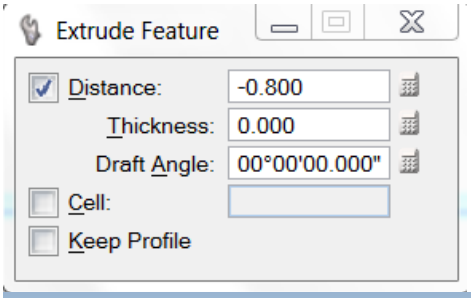
5) Open the ***Feature Modeling*** task bar (When in a 3D model the "***Feature Modeling***" task is available).

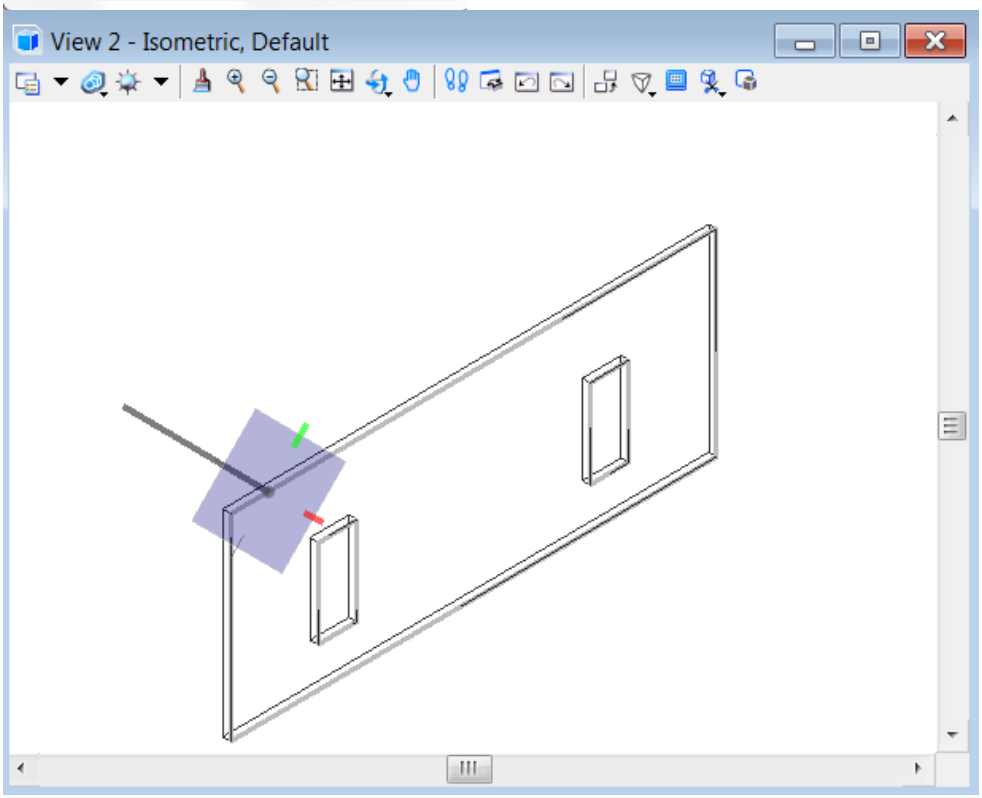


6) Select the **Extrude Feature** tool:



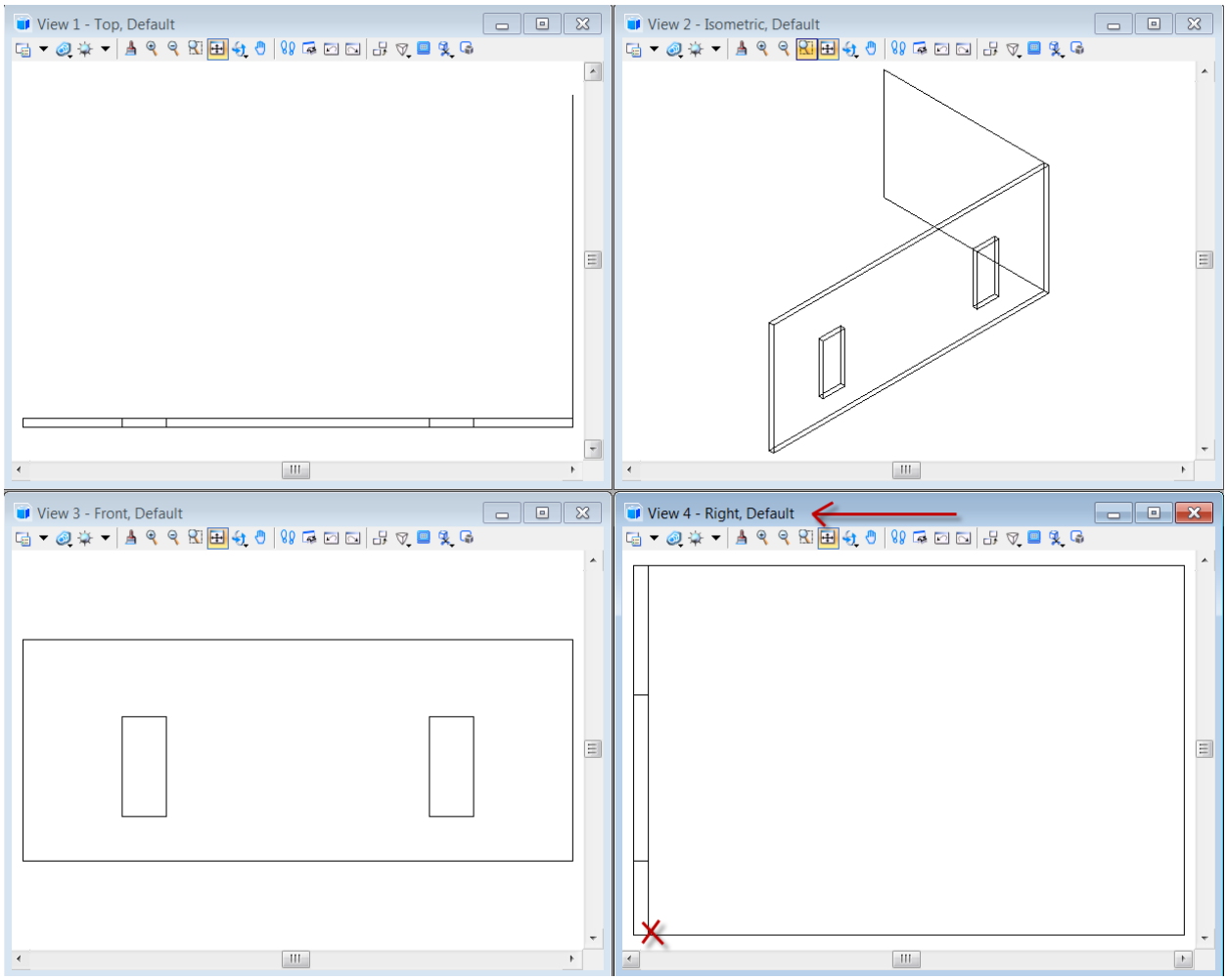
7) Key-in a distance of 0.8



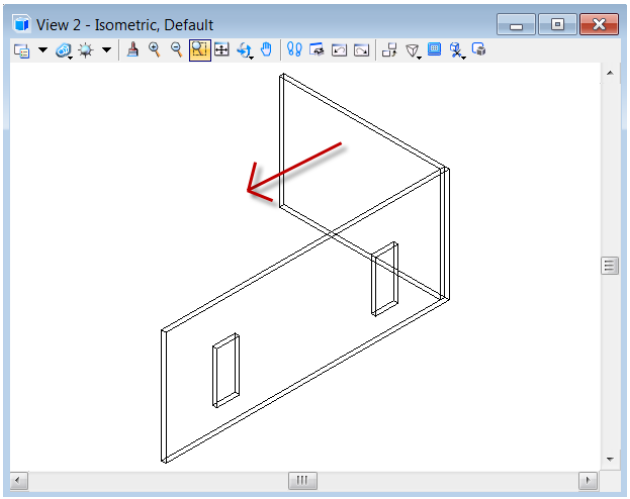


Select your wall and move the cursor to the internal direction to create a 0.8 distance.

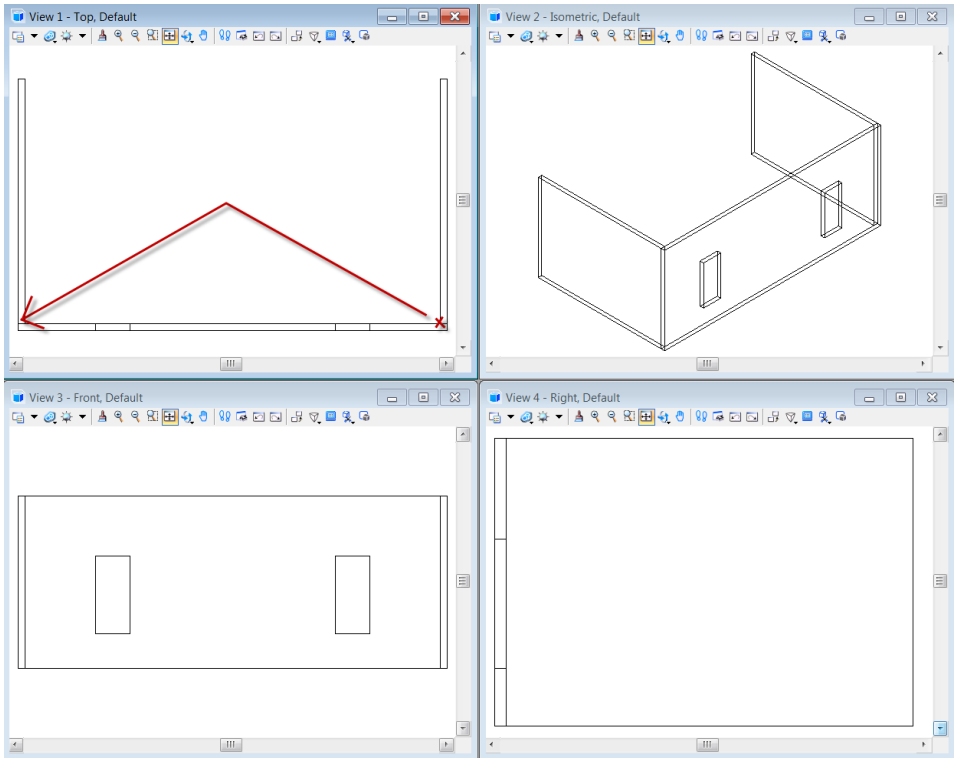
8) Go to the **Right** view and use the ***place block*** command to draw a rectangle 28.4 x 20. Use snaps to ensure connection to the lower inside portion of the wall you have just drawn.



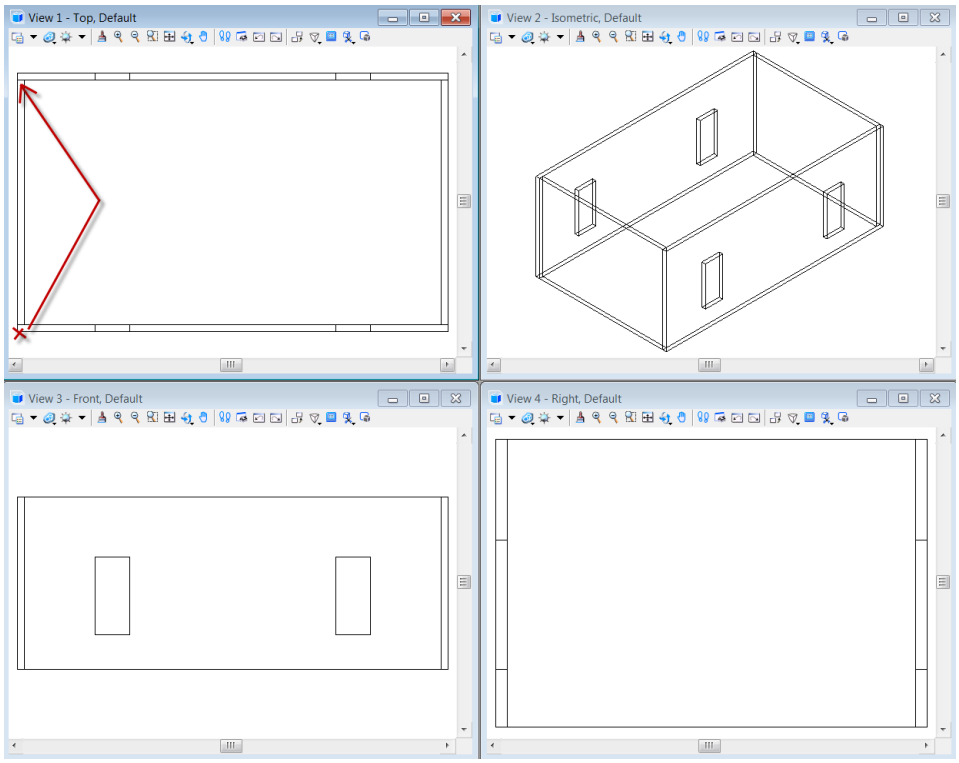
In the Isometric view use the ***Extrude Feature*** and select your wall and move the cursor to the internal direction to create a 0.8 distance.



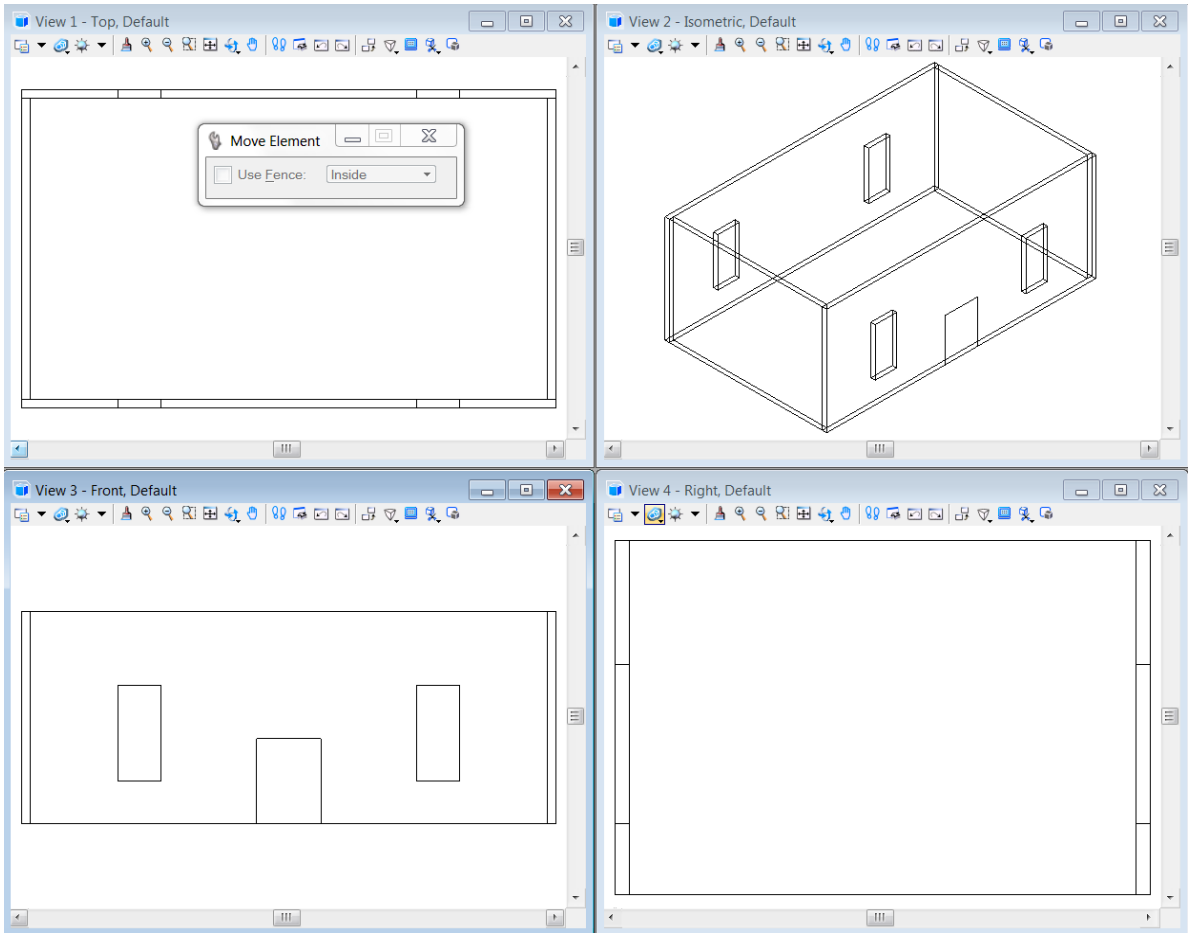
9) ***Copy*** the new side wall over to the opposite side using the proper snaps as shown low below:



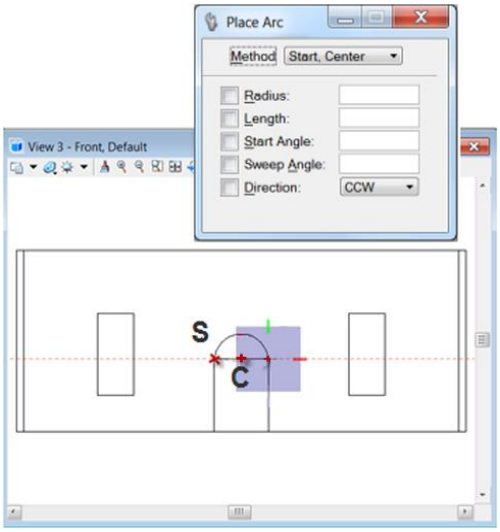
Do the same for the Front wall to achieve the following results:



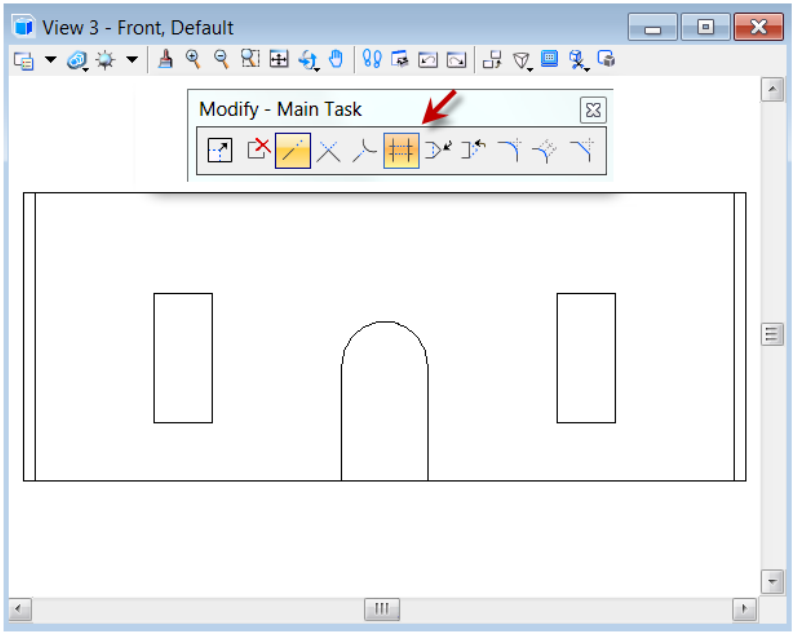
10) Use the ***Place block*** command to draw an 6 X 8 door at the mid-point of in the Front view.



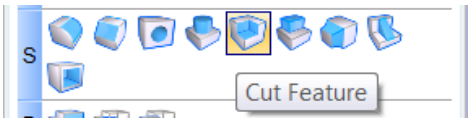
11) Use the ***Place Arc*** command to construct an archway on top of the door: Set the **Method** to **Start, Center.**



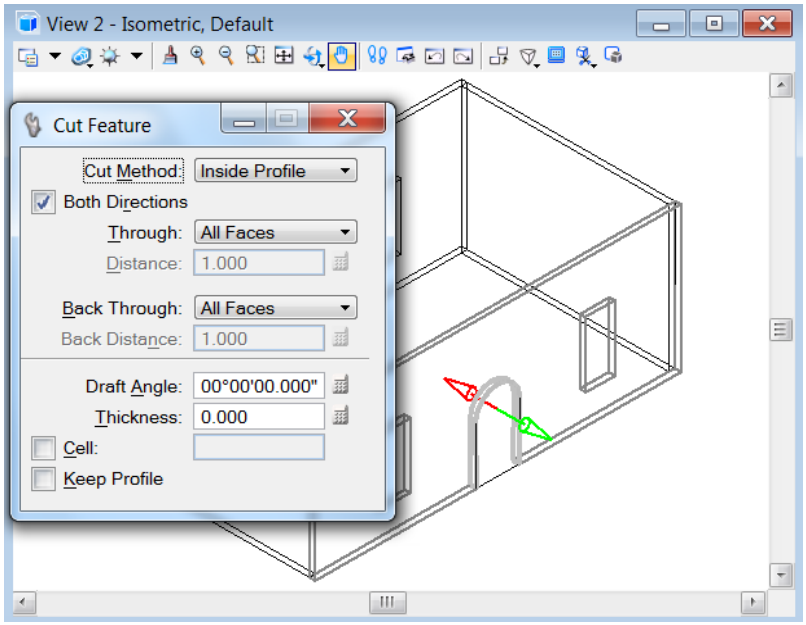
12) **Trim** out the top line of the door (leave the bottom as is):



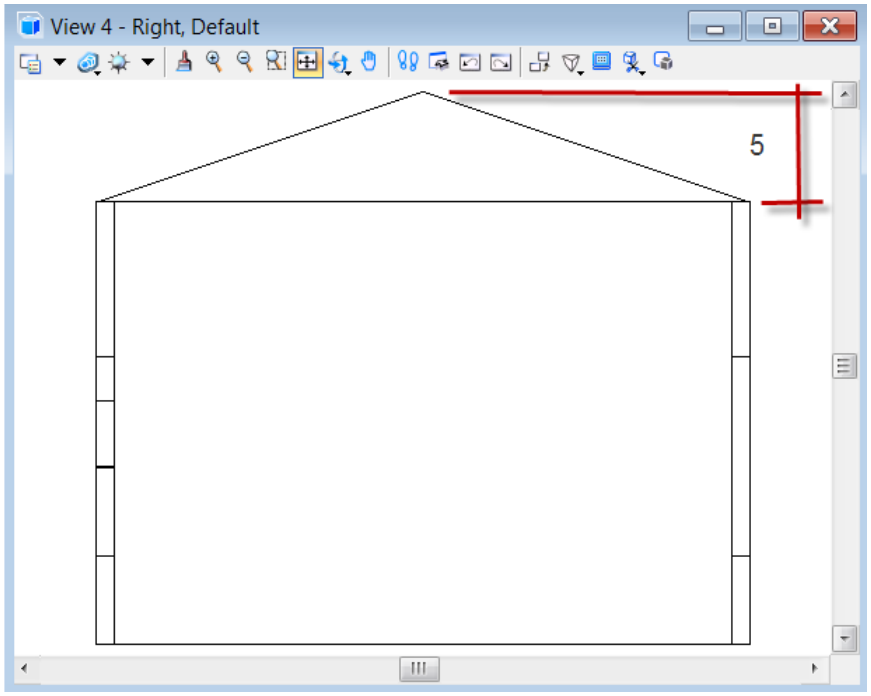
13) Use the ***Cut feature*** tool with settings as shown below to open the door way:



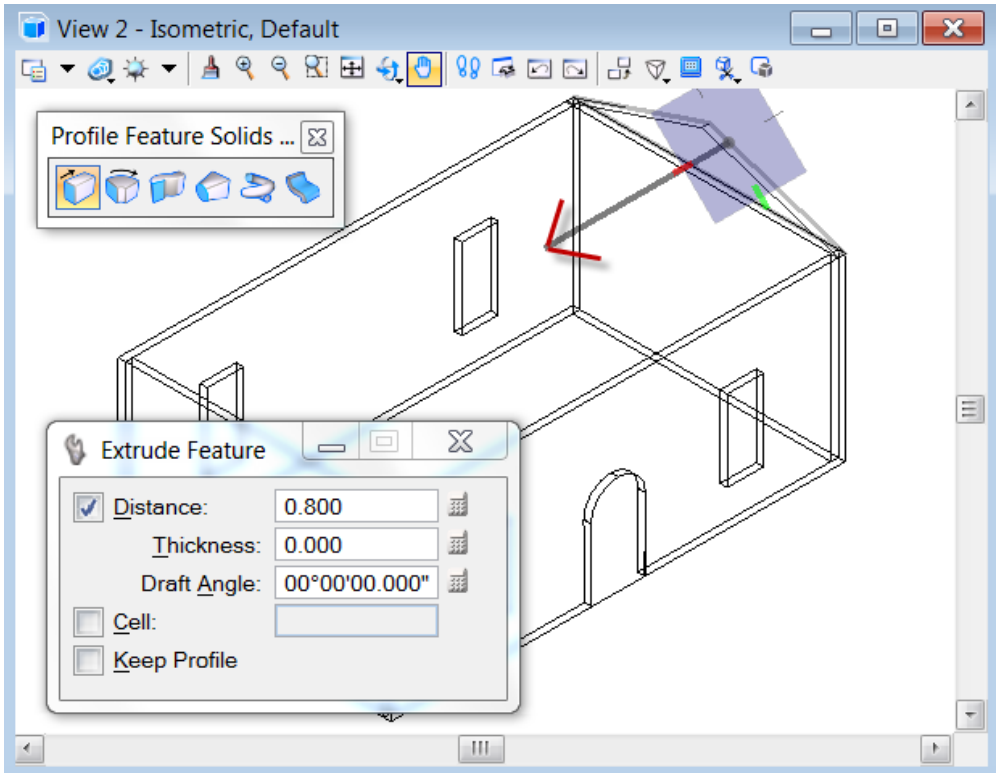
1) **<u>First select the Front wall</u>** then 2) **<u>select the top doorway Arc</u>**: Data point to accept. ***(2 PICK PROCESS)***



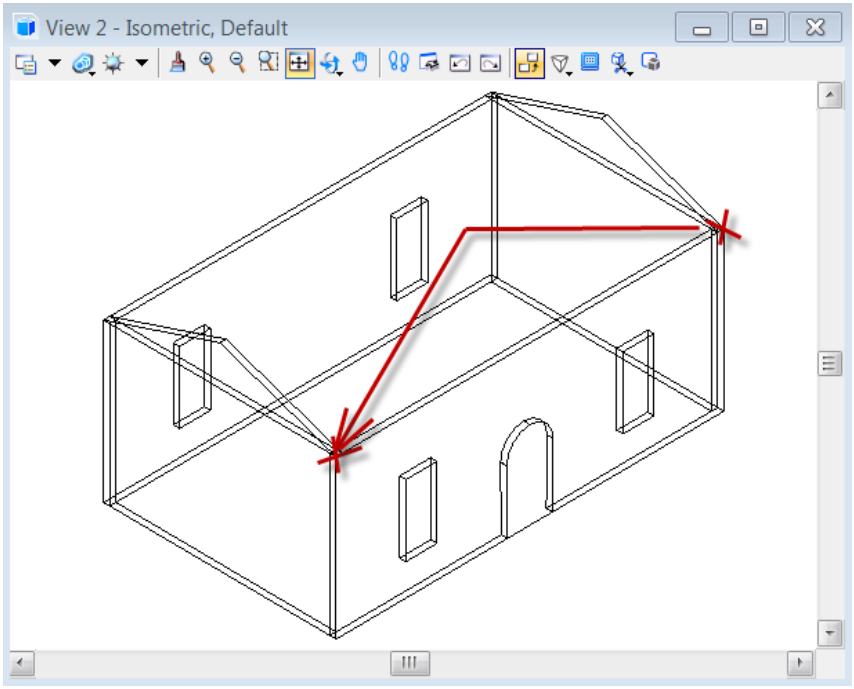
14) Go to the Right view and construct the side of the roof as follows:



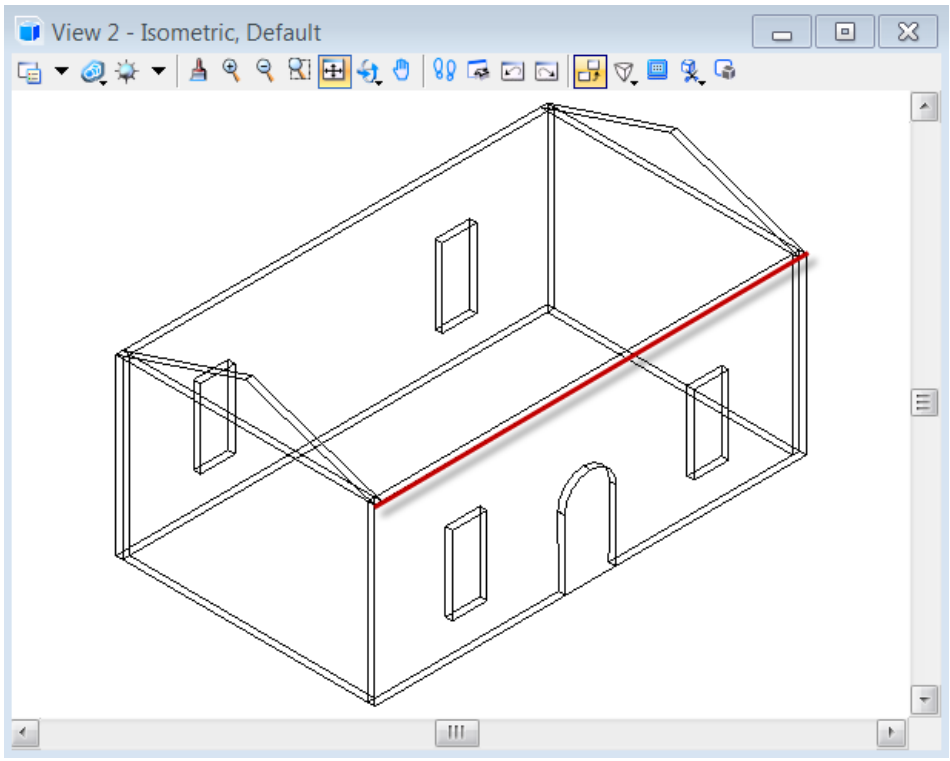
15) Use the **Extrude feature** command with a distance of 0.8 to match what is shown below:



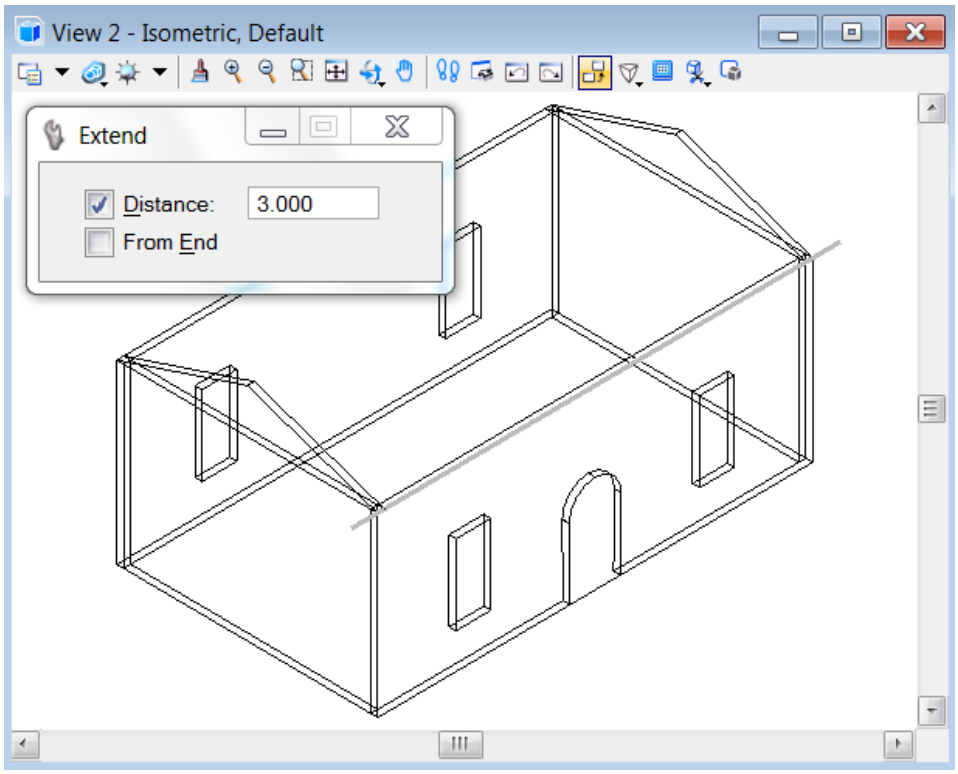
16) Copy the side roof over to the opposite side using the proper snaps as shown below:



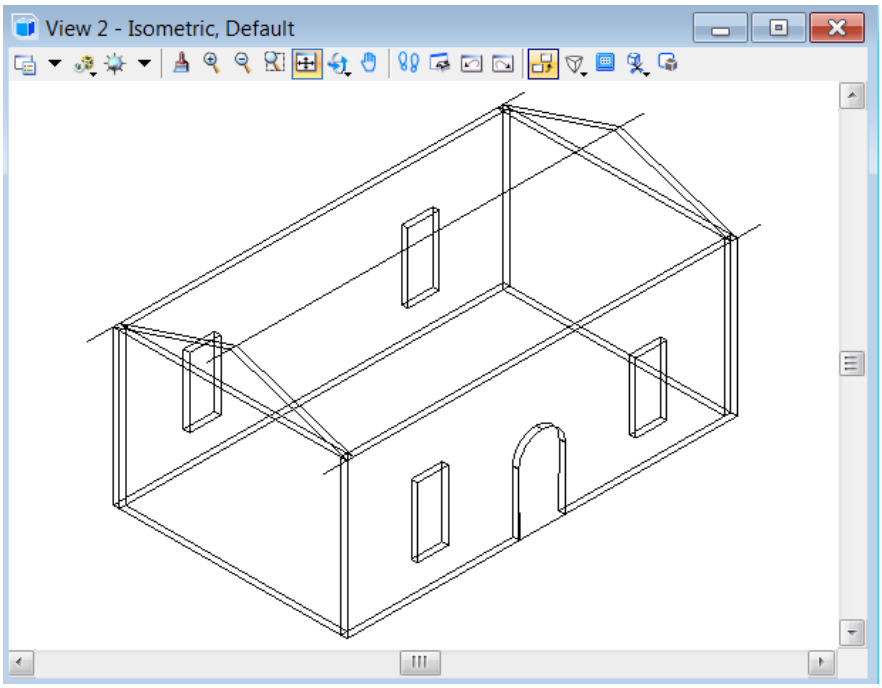
17) Construct a **line** as shown below across the top of the structure (Red is used only to highlight the action):



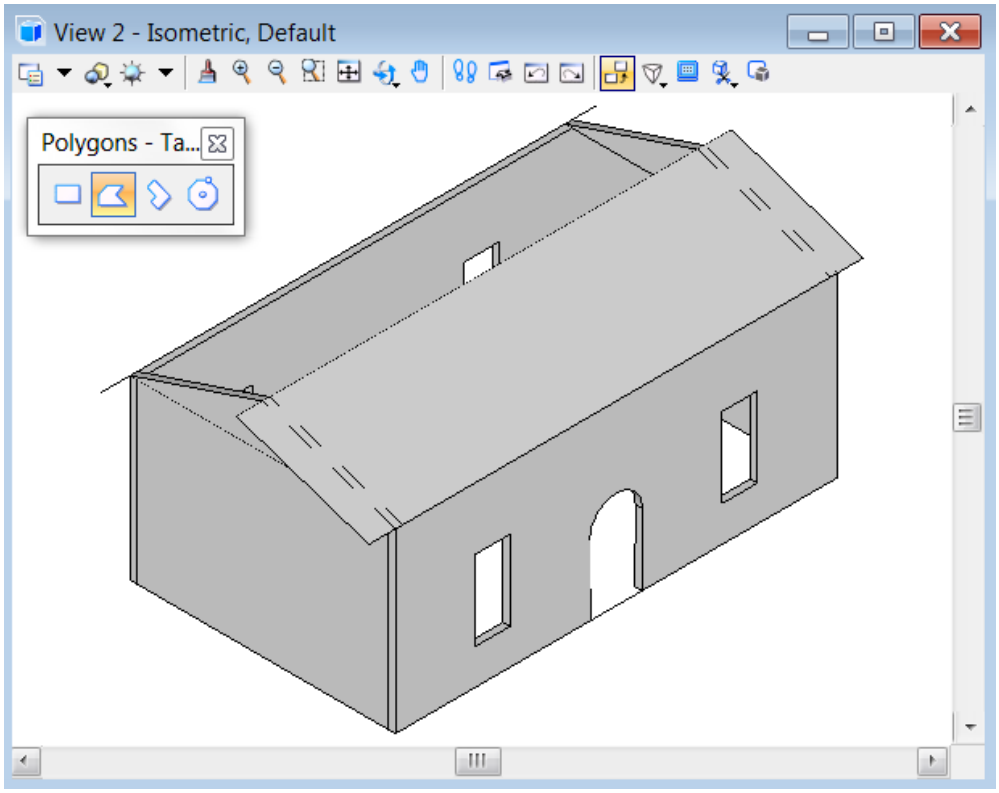
18)***Extend*** the line by a value of 3 on each side:



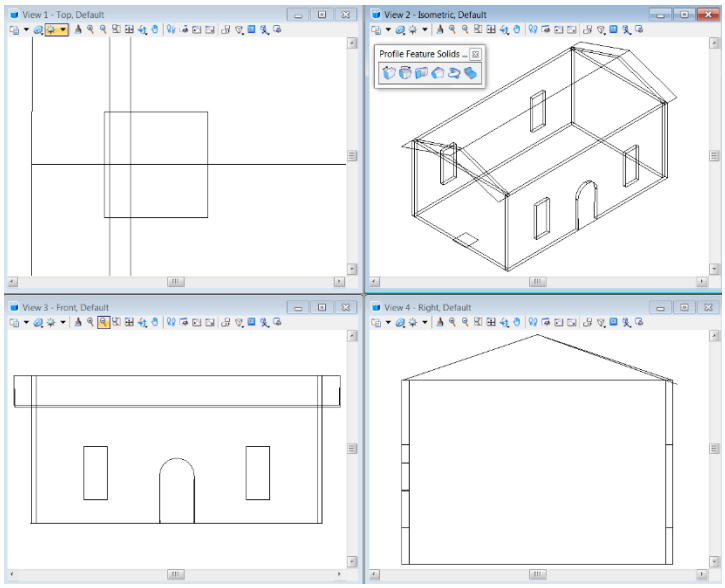
19)**Copy** this line over to the two locations as shown below (Use your snaps).



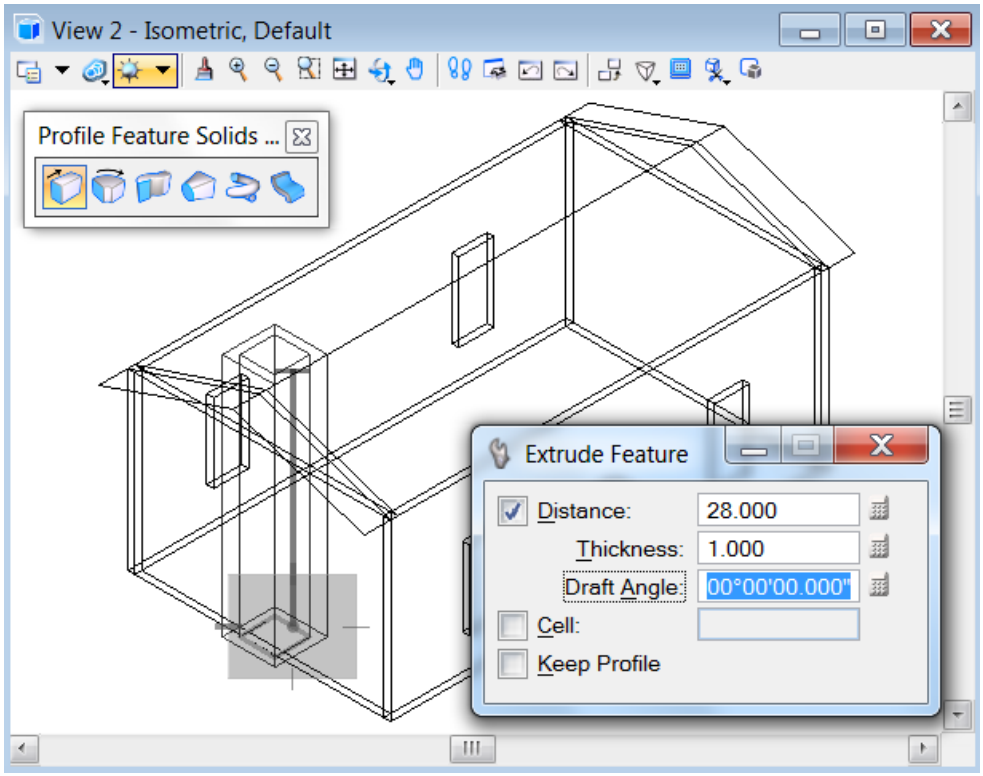
20) Use the ***Place Shape*** tool and connect 4 closed points to create the top half of your roof as shown below. Repeat this for the opposite side of the roof:



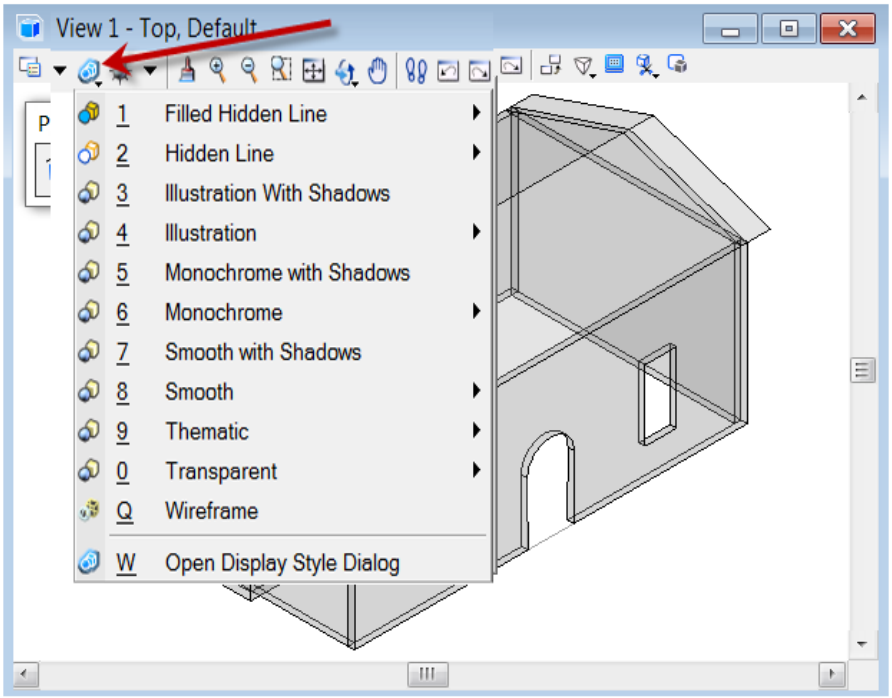
21) In the **Top** View Draw a symmetrical 4 X 4 chimney. Move the chimney slightly outside the external wall, do not eye the move but move it with a direct value input (or snaps) to keep properly aligned with the 3D model.



22) Use the ***Extrude Feature*** with a distance of 28 and a thickness of 1 in an upward direction to complete the chimney.

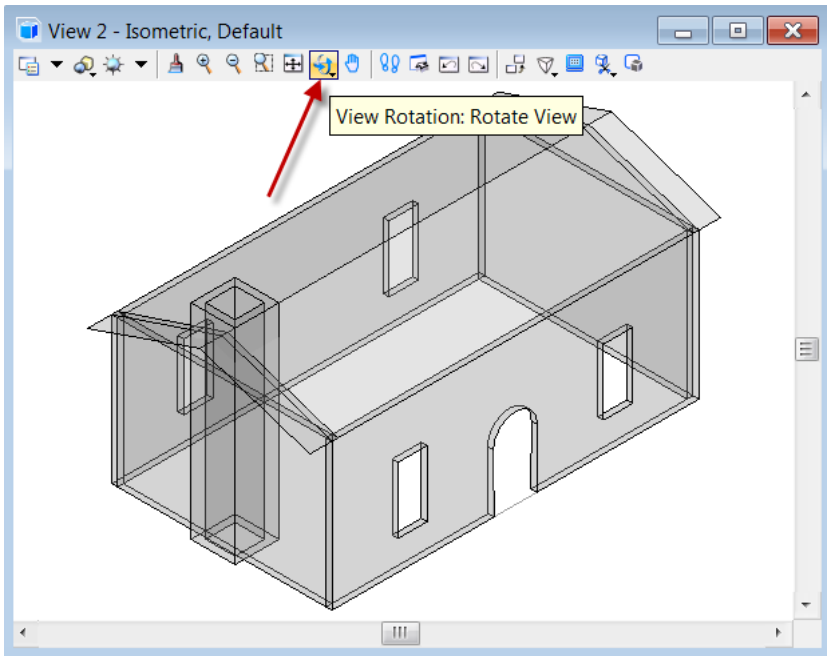


23) Hold down your cursor here to sample various shading modes:



Congratulations you've created a 3D model!

24) Let's move our models view perspective in the isometric view: Select **View Rotation: Rotate view** then data point, then move your cursor around to watch your perspective spin freely about the model.



You can also experiment with the **View Perspective: Change View Perspective** tool to experience perspective changes.