CE367G Geometric Design Lab

Computer-Aided Design for Roadway Alignments

This homework consists of 4 computer-based assignments, performed in MicroStation (a common CAD package). Students should perform the labs in ECJ's 2nd floor lab classroom (ECJ 2.218), printing out the final results of each lab to turn in on 2/23/17 at the beginning of class.

NOTE: Please be careful to complete all steps in Lab 1, being sure to explore all MicroStation tools and menus available in Lab 1, since this will save precious time (and avoid serious headaches) in subsequent Labs.

Before you begin, please be sure to view the short videos for each lab, developed by Dr. Thomas *Rioux* for a general overview of each lab's contents. (Those video links are found before the lab links, at the above URL.)

After lab access

To access MicroStation from home or computers other than the one in the labs assigned for the course, Virtual Desktop can be accessed.

i) http://www.engr.utexas.edu/itg/facilities/virtualdesktop
ii) https://wikis.utexas.edu/display/engritgpublic/Connecting+to+the+University+of+Texas+VPN
iii) https://appd.engr.utexas.edu/appdportal

The virtual desktop lets you access a major array of resources online, courtesy of the Cockrell Engineering School. The first website above gives you all the information required to set up a Virtual Desktop account. Some nuances about setting up a Virtual Private Network (VPN) is addressed in the second website. Once everything is setup, the third website can be used in your browser, with the software it prescribes, to connect to the Virtual Desktop.

Alternatively, MicroStation on can be installed on your personal computer/laptop. To do this, follow the instructions at this link,

http://www.ce.utexas.edu/prof/kockelman/ce367_201101/MicroStationAccessFromHomePC.pdf

CE367G Geometric Design Lab - Lab 01
Introduction to MicroStation

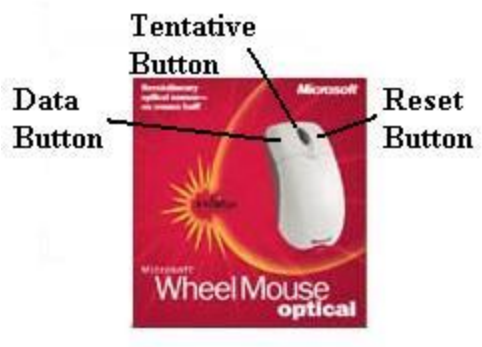
Objective: Learn the basics of MicroStation required to operate GEOPAK.

Activity: Learn the basics of MicroStation by downloading 2D seed file and level library. Define settings.

Background: MicroStation is a Computer Aided Drafting (CAD) software package. GEOPAK is an MDL application that runs on MicroStation. Some knowledge of MicroStation is required to operate GEOPAK.

Prerequisites: You must have an " Austin" domain computer account. If you do not have an "Austin" domain computer account, please see the instructor. To activate your " Austin" domain computer account, please go to http://www.caee.utexas.edu/itss/useraccounts-lrc-students.cfm and follow the instructions.

In MicroStation, the Left Button on the 3-button mouse is called the Data Button, the Middle Button (wheel) is called the Tentative Button, and the Right Button is called the Reset Button.



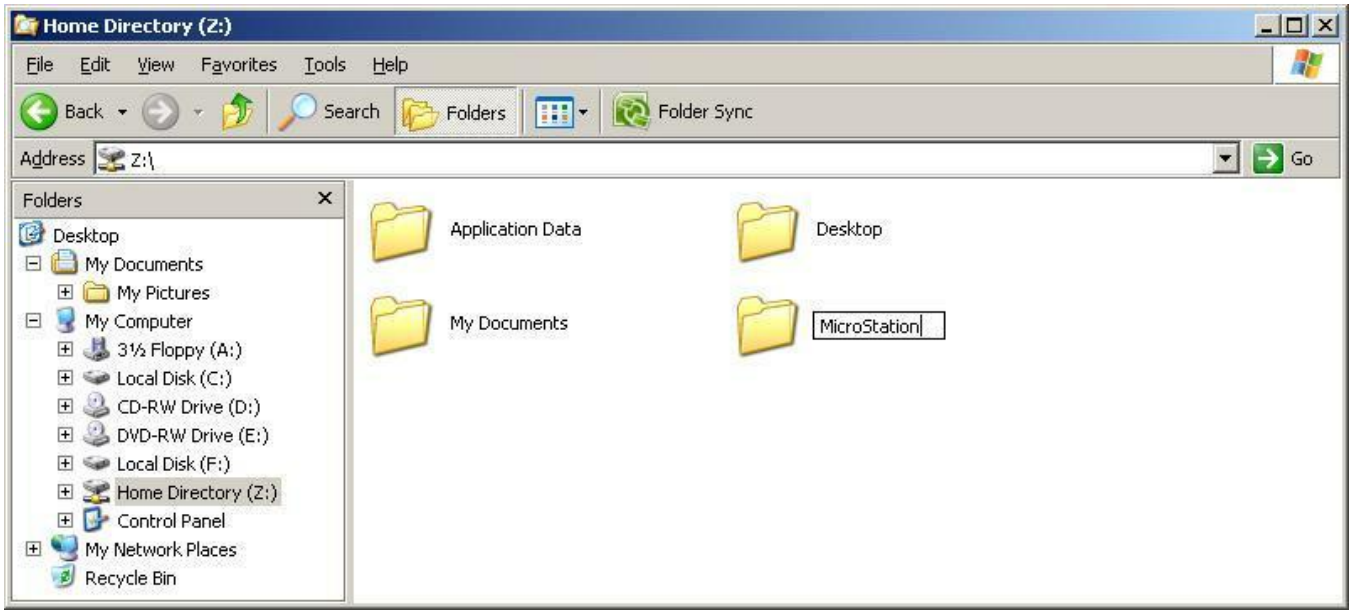
A. Start Windows Explorer and create a MicroStation folder Z:\ MicroStation.

A.1. From the Windows Start Menu in the lower left corner of the screen, choose **Start -> All Programs -> Accessories -> Windows Explorer**.

A.2. From the My Documents dialog box, expand "**My Computer**" and if "Home Directory (Z:)" is not listed then contact the instructor.

A.3. From the My Documents dialog box, select "**Home Directory (Z:)**".

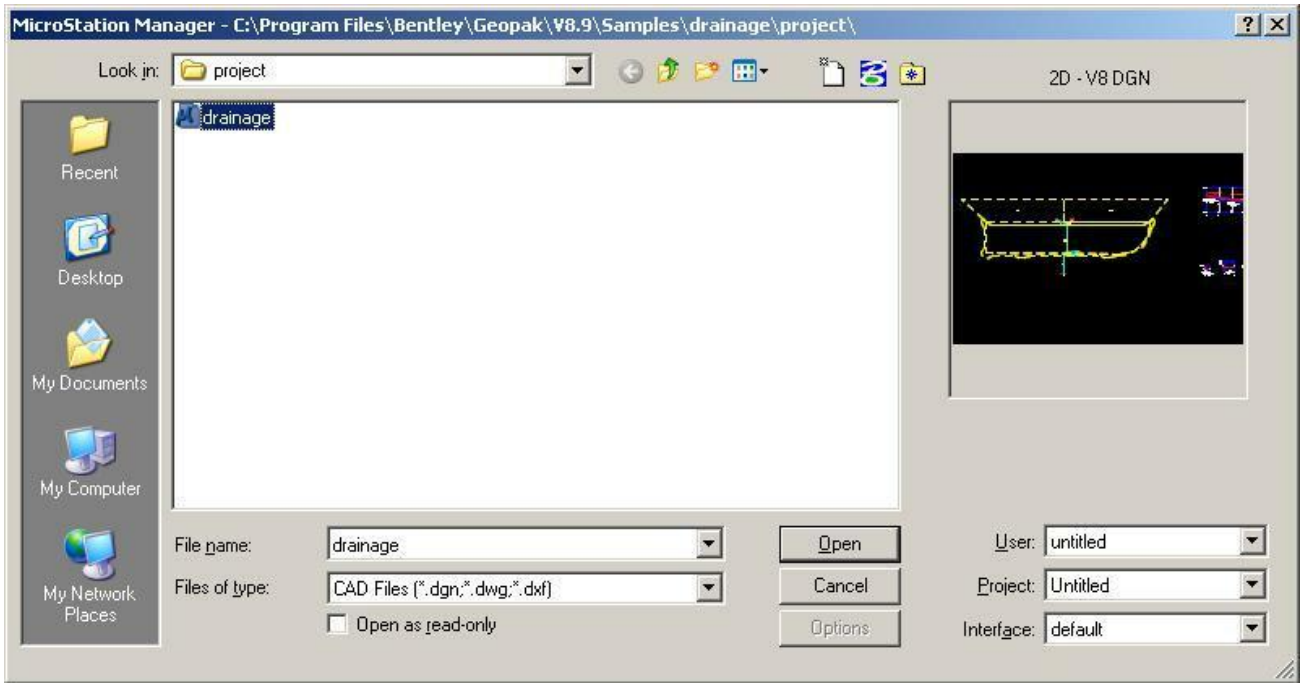
A.4. From the My Documents dialog box, choose **File -> New -> Folder** and replace "New Folder" with **" MicroStation".**



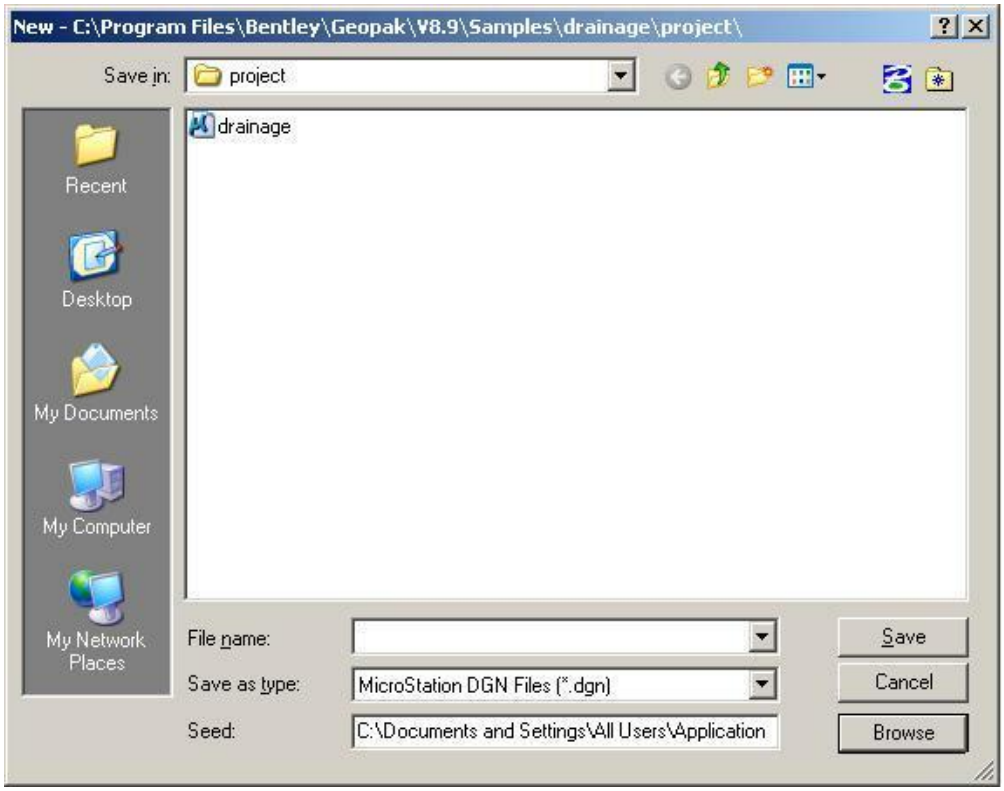
B. Start MicroStation and create a 2D design file seed file "Z:\MicroStation\train2d.dgn" using the standard seed file "seed2d.dgn".

B.1. From the Windows Start Menu in the lower left corner of the screen, choose **Start -> All Programs -> Bentley -> MicroStation -> MicroStation**.

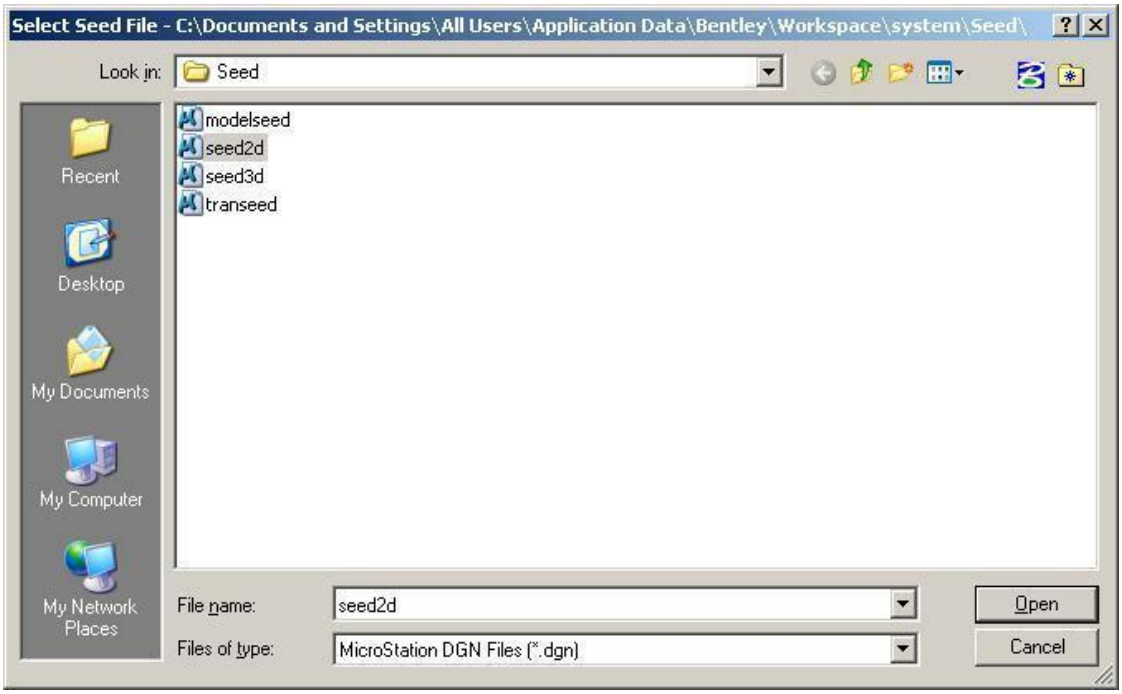
B.2. From the MicroStation Manager dialog box, press the New File push button  from the top line.



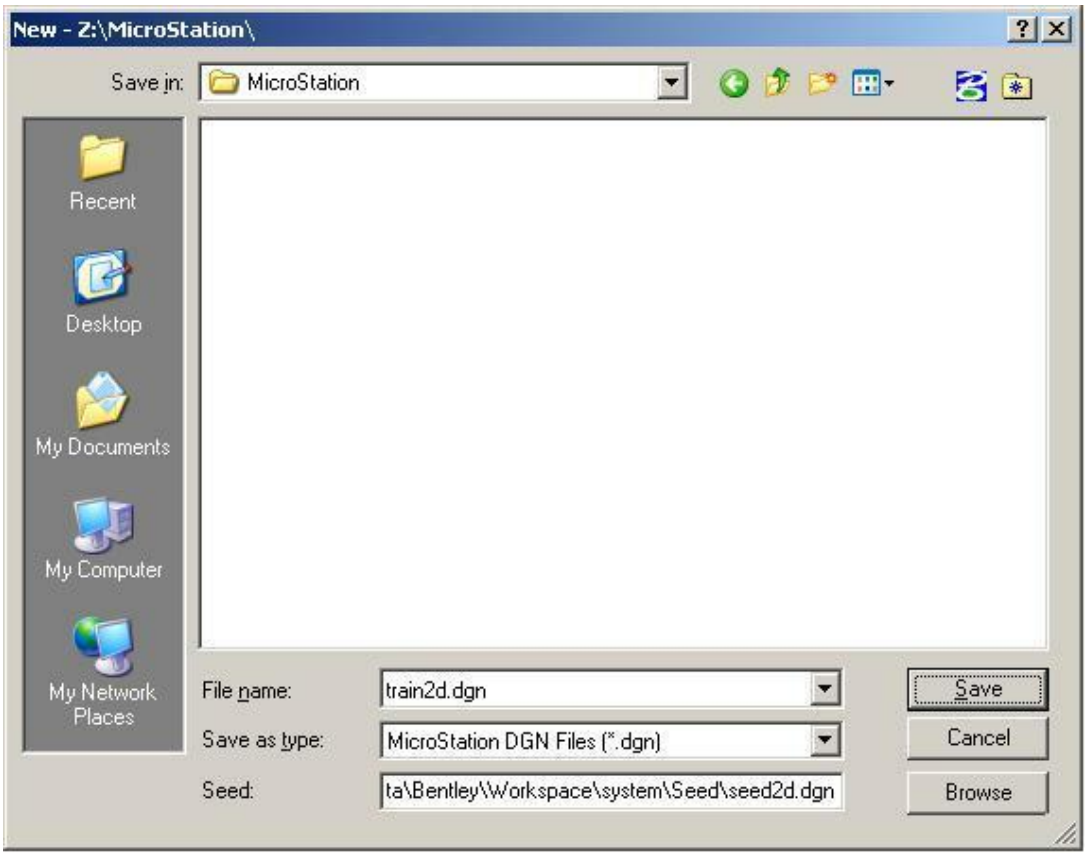
B.3. From the New dialog box in the **Seed File** line, press the **Browse** push button.



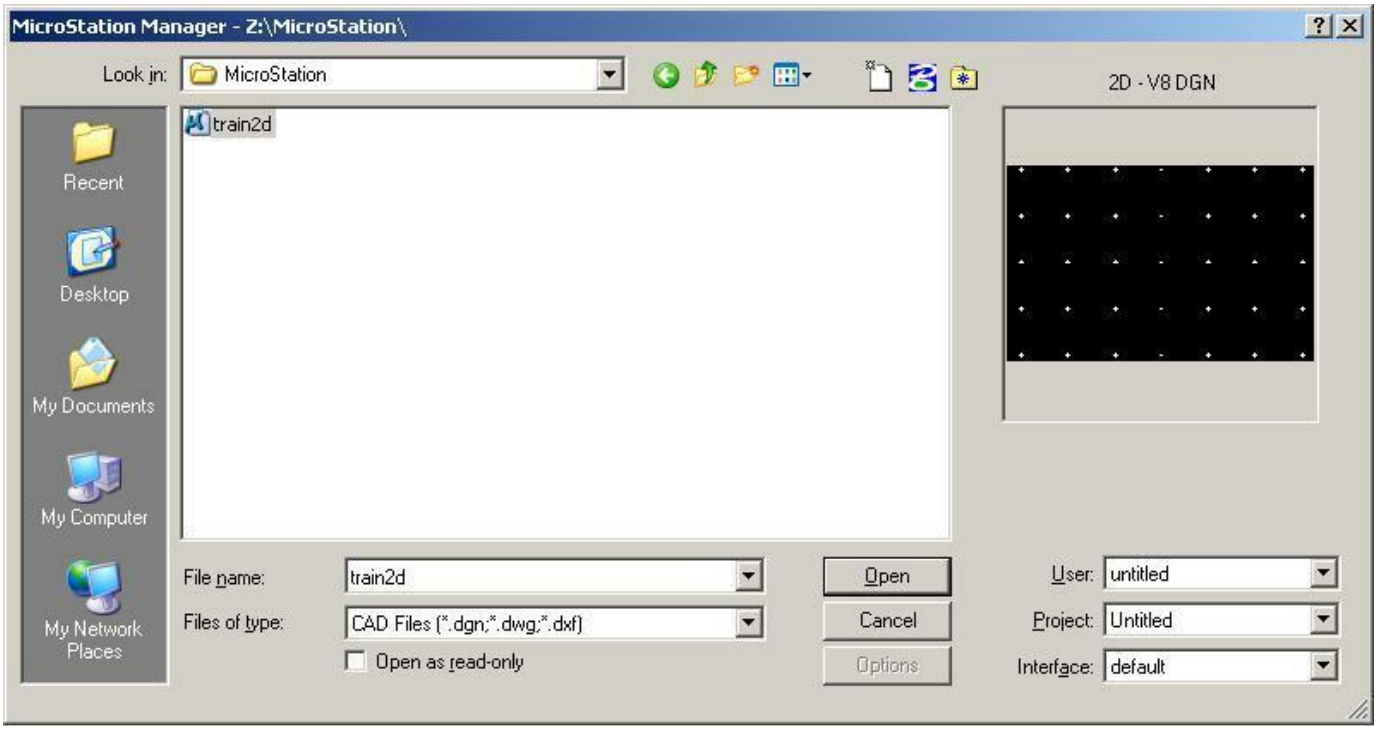
B.4. From the Select Seed File dialog box in **Look in**, select the device and directory for MicroStation seed files (normally "**c:\Documents and Settings\All Users\Application Data\Bentley\Workspace\system\Seed**"); then select **seed2d.dgn**; and finally press the **Open** push button. "**c:\Documents and Settings\All Users\Application Data\Bentley\Workspace\system\Seed\seed2d.dgn**" should now appear as the Seed File in the New dialog box.



B.5. From the New dialog box in **Save In**, choose "**Z:\MicroStation**"; in **File name** enter **train2d.dgn**; in **Save as type**, select **MicroStation DGN Files (*.dgn)**; and finally press the **Save** push button.

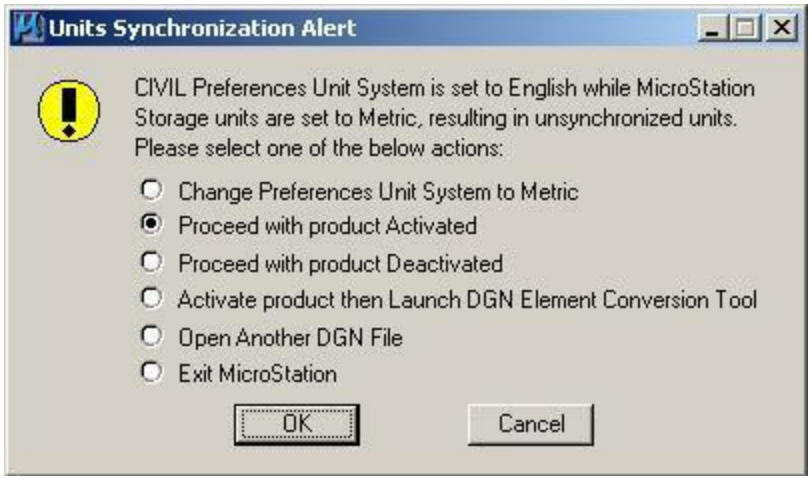


B.6. From the MicroStation Manager dialog box in **Look in**, choose "**Z:\MicroStation**"; in **Files of type**, select "**CAD Files (*.dgn;*.dwg;*.dxf)**"; in **File name**, select **train2d.dgn**; set **User:** to **untitled**; set **Project:** to **Untitled**; set **Interface:** to **default**; and finally press the **Open** push button.



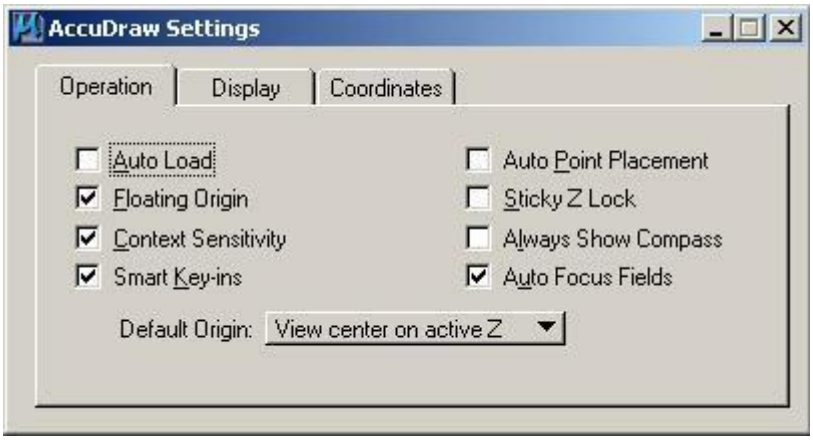
C. Set the MicroStation Design File Settings.

C.1. If a Units Synchronization Alert dialog box appears, select **Proceed with product Activated** and press the **OK** push button.



C.2. From the MicroStation dialog box, choose **Settings -> AccuDraw**.

C.3. In the AccuDraw Settings dialog box under the **Operation** tab, set **Auto Load** to **off** and **close** the AccuDraw Settings dialog box by pressing the "**X**" in the upper right corner of the dialog box.

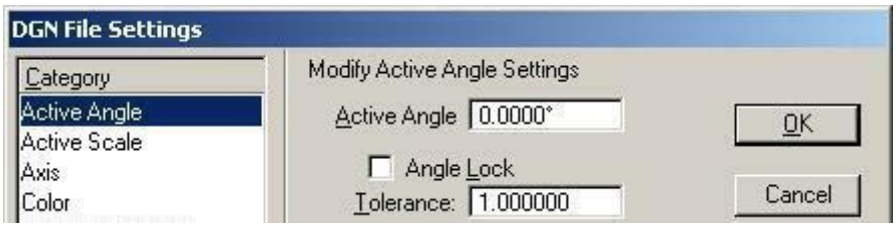


C.4. If there is an AccuDraw dialog box currently docked, **drag** the AccuDraw dialog box to the middle of the MicroStation window by placing the mouse over the four vertical dots , pressing and holding the left mouse button, moving the mouse into the MicroStation window, and releasing the mouse button.

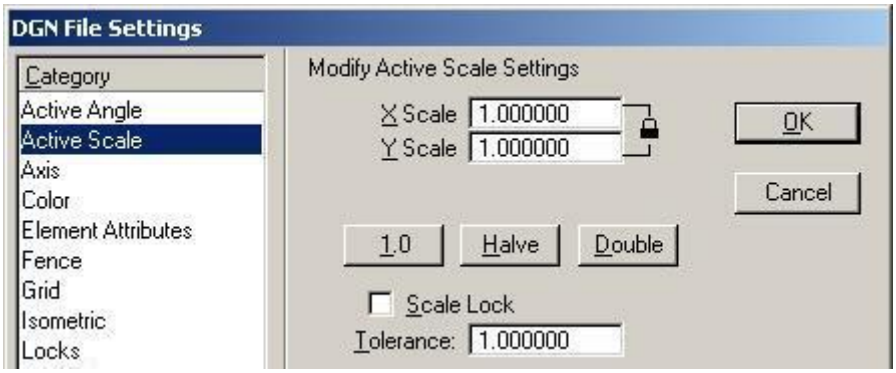
C.5. If there is an AccuDraw dialog box currently open, **close** the AccuDraw dialog box by pressing the "**X**" in the upper right corner of the dialog box.

C.6. From the MicroStation dialog box, choose **Settings -> Design File...**

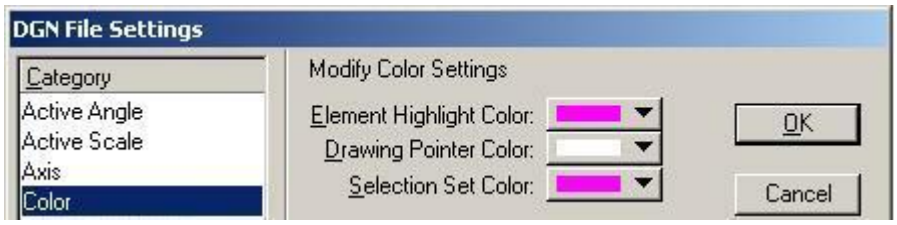
C.7. In the DGN File Settings dialog box under **Category**, choose **Active Angle**. In the **Modify Active Angle Settings** area, set **Active Angle** to **0.0**; set **Angle Lock** to **off**; and set **Tolerance** to **1.0.**



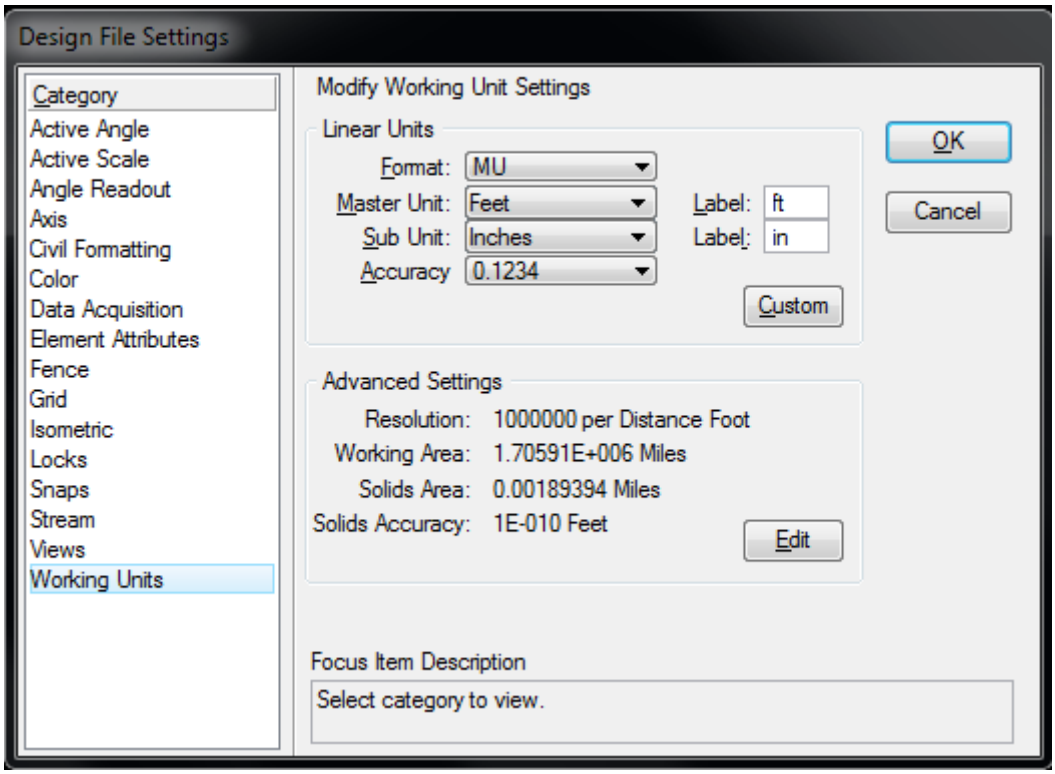
C.8. In the DGN File Settings dialog box under **Category**, choose **Active Scale**. In the **Modify Active Scale Settings** area, press the **1.0** button, ensure that the lock to the right of the X Scale and Y Scale boxes is in the **locked** position (press the lock if it is not in the locked position); set **Scale Lock** to **off**; and set **Tolerance** to **1.0**.



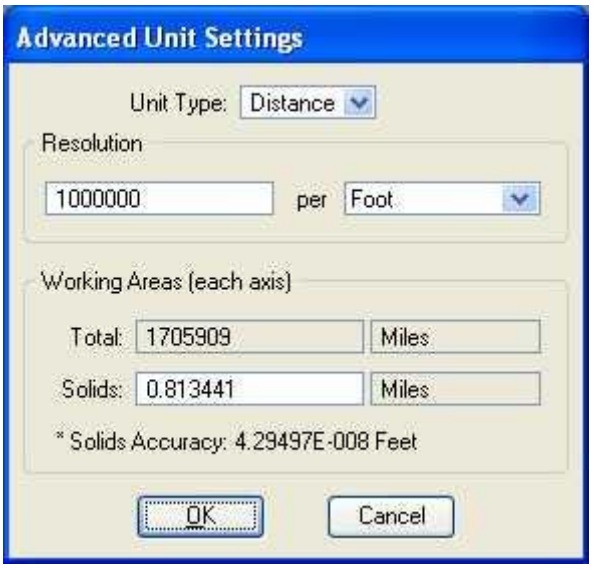
C.9. In the DGN File Settings dialog box under **Category**, choose **Color**. In the **Modify Color Settings** area, press the **Element Highlight Color** button and choose the color **magenta**, press the **Drawing Pointer Color** button and choose the color **white**, and press the **Selection Set Color** button and choose the color **magenta**.



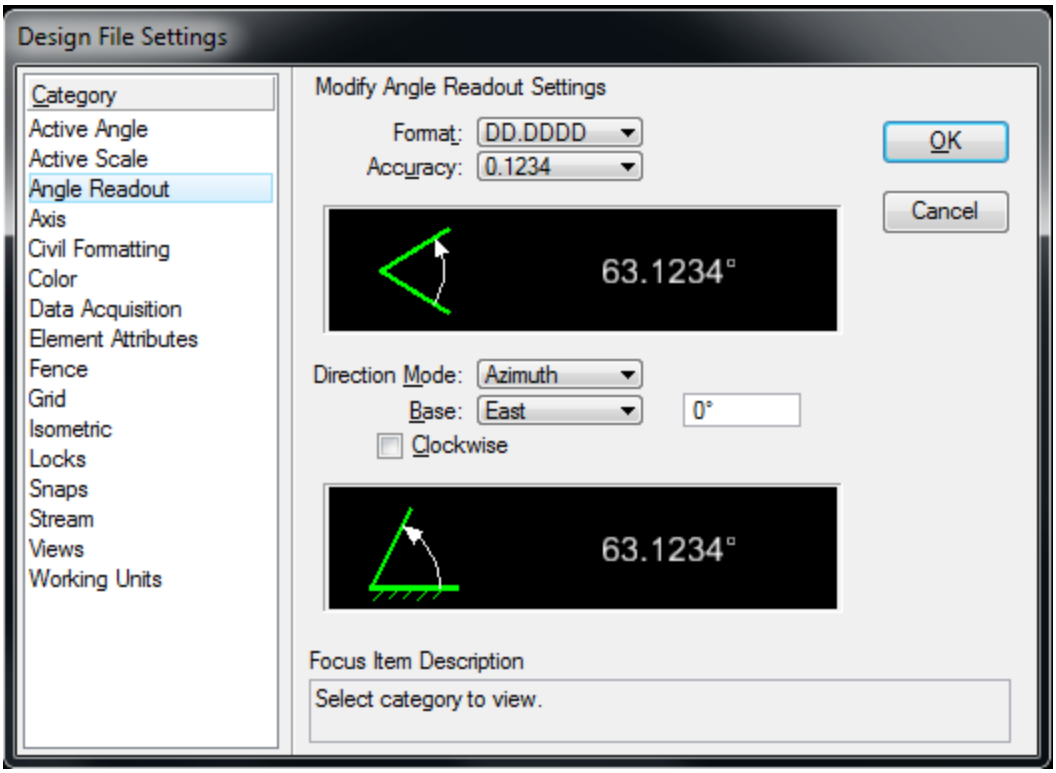
C.10. In the DGN File Settings dialog box under **Category**, choose **Working Units**. In the **Modify Working Unit Settings** area, in the **Linear Units** group, set **Format:** to **MU** (for Master Units), set **Master Unit:** to **Feet** (not US Survey feet) and set **Label:** to **ft**, set **Sub Unit:** to **Inches** and set **Label:** to **in**, and set **Accuracy** to **4** decimals.



In the **Advanced Unit Settings** dialog box, set **Unit Type** to **Distance**, set **Resolution** to **1000000 per Foot** (not US Survey foot), and press the **OK** push button.



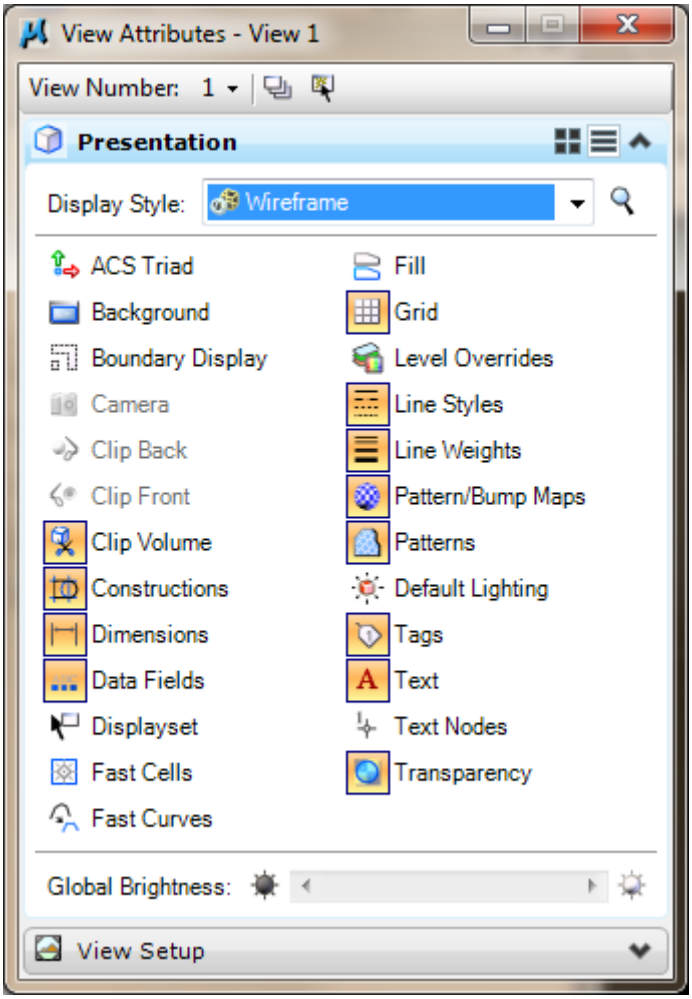
C.11. In the DGN File Settings dialog box under **Category**, choose **Angle Readout**. In the **Modify Angle Readout Settings** area, set **Format:** to **DD.DDDD**, and set **Accuracy** to **4** decimals**.** Return to the **Modify Working Unit Settings** area, in the **Advanced Settings** area, press the **Edit** push button. An Alert box should open; press the **OK** push button.



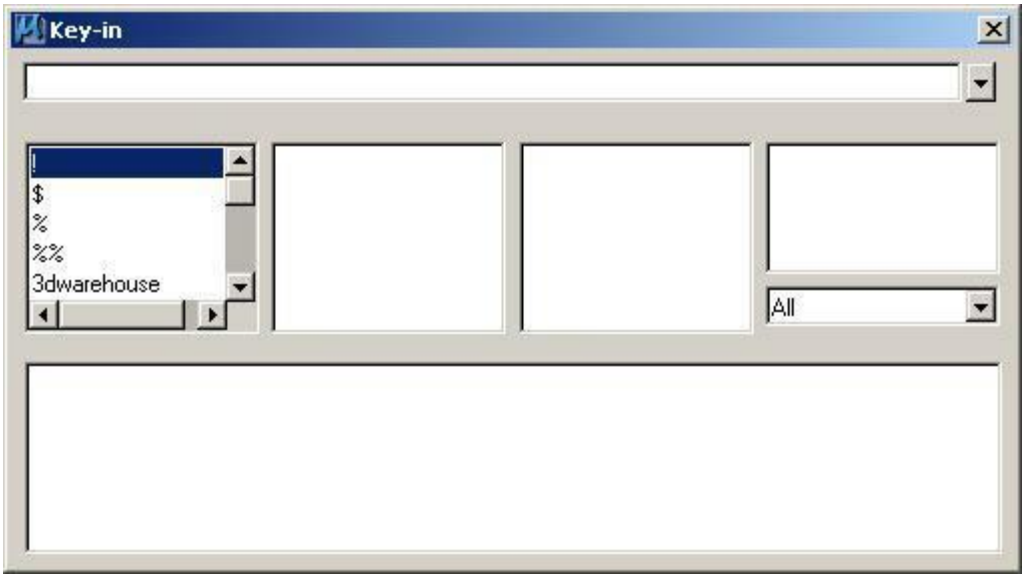
C.12. In the DGN File Settings dialog box, press the **OK** push button.

C.13. From the MicroStation dialog box, choose **Settings -> View Attributes**.

C.14. In the View Attributes dialog box, set **Display Style:** to **Wireframe**, **ACS Triad** to **off**, **Background** to **off**, **Boundary Display** to **off**, **Clip Volume** to **on**, **Constructions** to **on**, **Dimensions** to **on**, **Data Fields** to **on**, **Displayset** to **off**, **Fast Cells** to **off**, **Fast Curves** to **off**, **Fill** to **on**, **Grid** to **off**, **Level Overrides** to **off**, **Line Styles** to **on**, **Line Weights** to **on**, **Patterns/Bump Maps** to **on**, **Tags** to **on**, **Text** to **on**, **Text Nodes** to **off**, **Transparancy** to **on**, and **close** the View Attributes dialog box by pressing the "**X**" in the upper right corner of the dialog box.



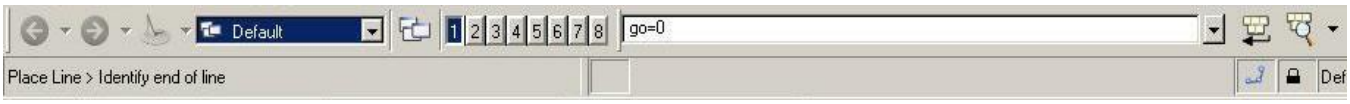
C.15. From the MicroStation dialog box, choose **Utilities -> Key-in**.



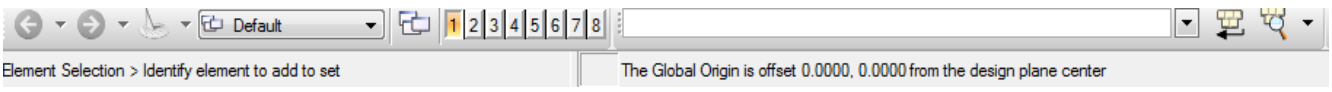
C.16. From the Key-in dialog box, **minimize** the Key-in dialog box by moving the mouse over the bottom edge of the Key-in dialog box until the up and down arrow appears, press and hold the left mouse button, move the mouse up until it is over the top edge of the Key-in dialog box, and release the left mouse button.

C.17. From the Key-in dialog box, **dock** the Key-in dialog box by moving the mouse over the words "Key-in" on the top edge of the Key-in dialog box, press and hold the left mouse button, drag the Key-in dialog box to the lower center part of the MicroStation dialog box, and release the left mouse button. This area will now be referred to as the key-in field.

C.18. From the MicroStation dialog box in the key-in field, enter "**go=0**" to set the global origin to zero and press the **enter** key.

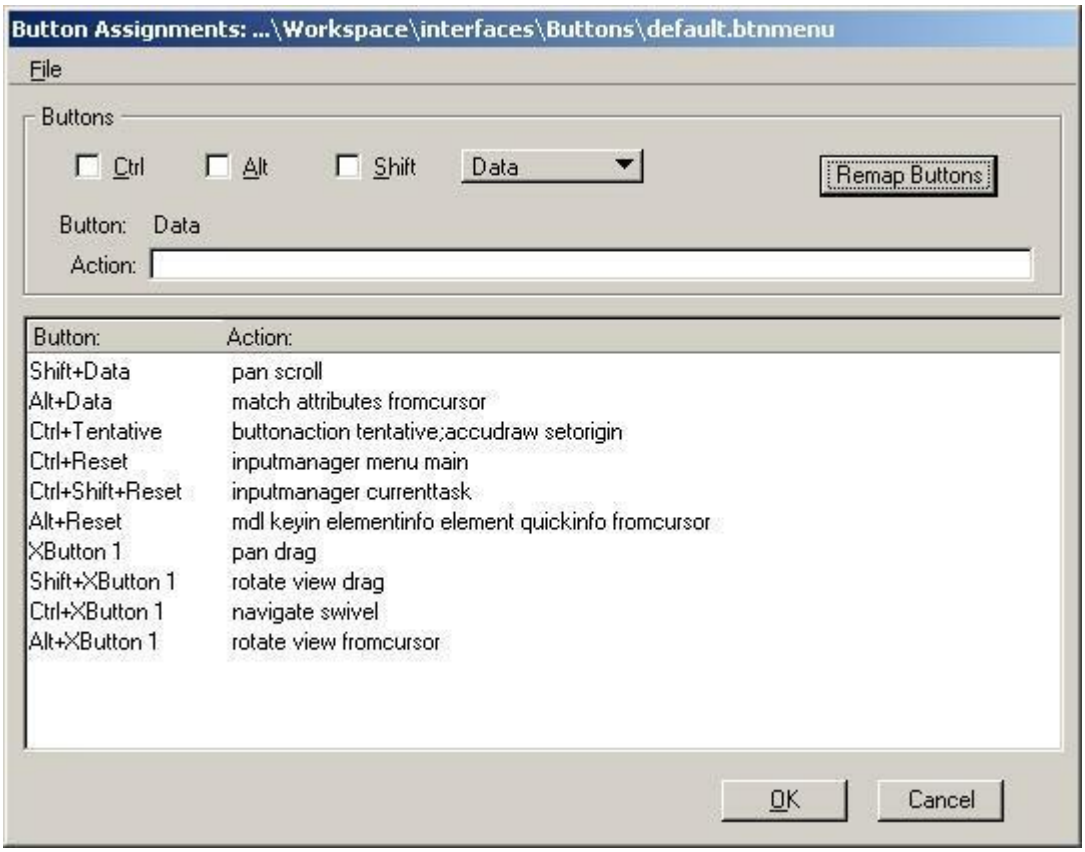


C.19. From the MicroStation dialog box in the key-in field, enter **"xy=0,0"** and press the **enter key.**

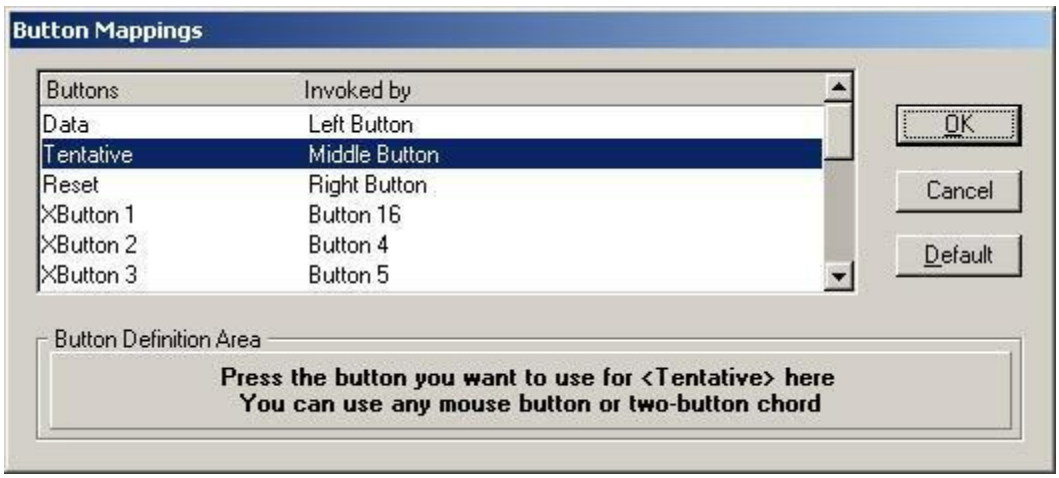


Notice the “The Global Origin is offset 0.0000, 0.0000 from the design plane center”.

C.20. From the MicroStation dialog box, choose **Workspace -> Button Assignments...** In the Button Assignments dialog box, press the **Remap Buttons push button.**

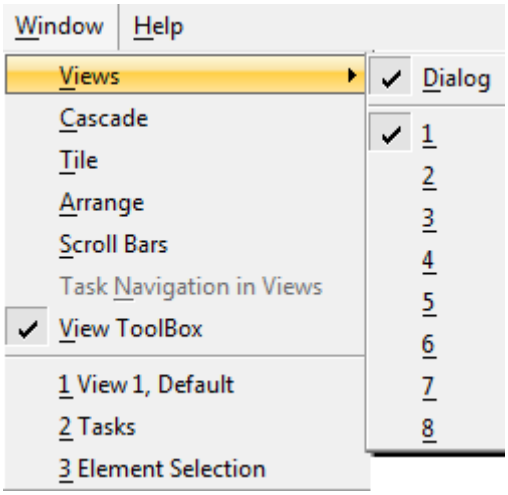


C.21. In the Button Mappings dialog box under Buttons, choose **Data**. If the assignment under Invoked by is anything other than Left Button then move the mouse into the Button Definition Area and press the **Left** mouse button. In the Button Mappings dialog box under Buttons, choose **Tentative**. If the assignment under Invoked by is anything other than Middle Button then move the mouse into the Button Definition Area and press the **Middle** mouse button (the wheel). In the Button Mappings dialog box under Buttons, choose **Reset**. If the assignment under Invoked by is anything other than Right Button then move the mouse into the Button Definition Area and press the **Right** mouse button. Finally, press the **OK** button.



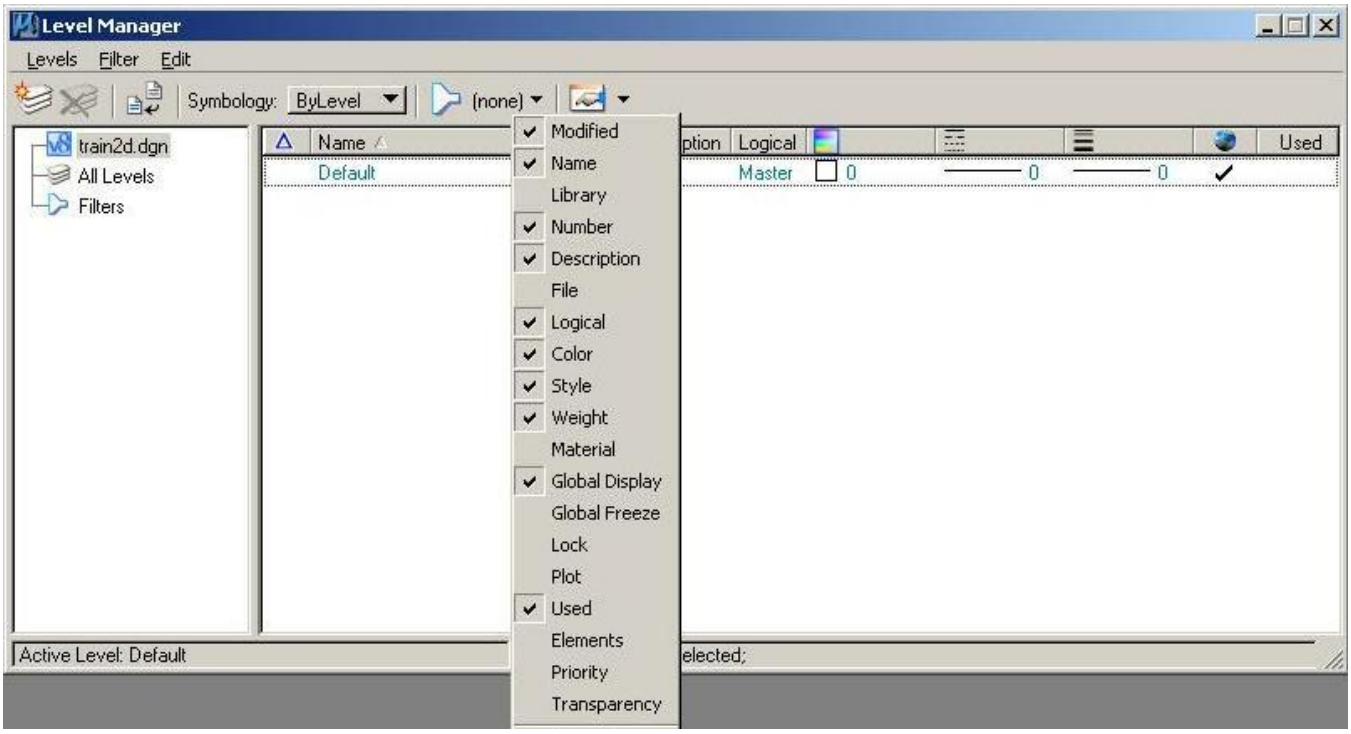
C.22. In the Button Assignments dialog box, press the **OK** button.

C.23. From the MicroStation dialog box, choose **Window -> Views**. If **2** has a check mark to the left of the number then press the number **2** to close view 2. Also close views 3-8 if open. 1 to 8 views may be on at any one time.



C.24. From the MicroStation View 1 dialog box in the upper right corner of the view, choose the **middle icon** to enlarge the view to the maximum size. The middle icon should look like the following image if it is at its maximum.

C.25. From the MicroStation dialog box, choose **Settings -> Levels-> Manager**. In the Level Manager dialog box, right-mouse-click the **Name** heading and choose the headings for **Modified**, **Name**, **Number, Description**, **Logical**, **Color**, **Style**, **Weight**, **Global Display**, and **Used**.



C.26. In the Level Manager dialog box, choose **Levels -> Library -> Attach…** Navigate to the "project" folder to find the **TxDOT_Design_v8i** file that you previously downloaded.

When completed, **close** the Level Manager dialog box by pressing the "**X**" in the upper right corner of the dialog box.

C.27. From the MicroStation dialog box, choose **File -> Save. Then choose File -> Compress -> Design. This physically removes all logically deleted elements.**

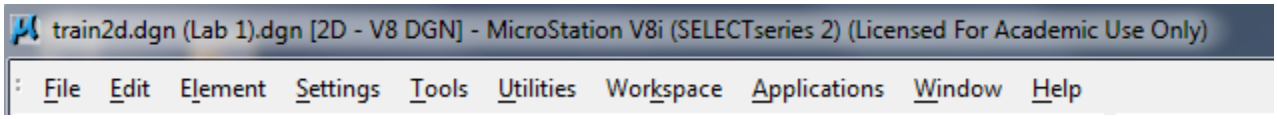
C.28. From the MicroStation dialog box, choose File -> Save Settings. This saves all the design file settings so that when the file is open the next time, all the settings will be restored.

D. Save the design file as " Z:\ MicroStation\lab_01.dgn".

D.1. From the MicroStation dialog box, choose File -> Save As...

D.2. In the Save As dialog box in Save in:, make sure " Z:\ MicroStation" is selected; then under Save as type:, select MicroStation V8 DGN Files [*.dgn]; then in File name:, enter "lab_01.dgn"; and finally press the Save push button.

D.3. The upper-left corner of the MicroStation dialog box should look like the following image.



E. Explore MicroStation.

E.1. The top of the MicroStation window has "File", "Edit", "Element", "Settings", "Tools", "Utilities", "Workspace", "Applications", "Window", and "Help" menus that provide the normal Windows functionality. See the above image. On some systems, "Applications" may not be displayed; please contact the instructor if this is the case.

E.2. The **File menu** contains the MicroStation specific items "Compress Design", "Save Settings", "Reference", "Print", "Exit", and others. Take this opportunity to look at the menus under File. Each time the user adds, deletes, or modifies an element with MicroStation, the change is immediately written to the design file.

E.2.a. **File -> Compress -> Design** is used to permanently delete MicroStation elements (amongst other things) that have been marked for deletion by the user from the current design file.

E.2.b. **File -> Save Settings** saves the current MicroStation settings in the current design file so that when the file is entered again, the same views, levels, etc. are restored.

E.2.c. **File -> References** allows the user to attach, detach, and manipulate reference files. Up to 256 reference files may be attached to a single design file for read-only access to the data. The reference files may be the current MicroStation design file, other MicroStation design files, or raster files. Each reference file may be displayed or not displayed and the levels to be displayed may be specified for each design reference file.

E.2.d. **File -> Print** allows the user to generate hard copy output of the design file.

E.2.e. **File -> Exit** terminates your MicroStation session.

E.3. The Edit menu contains the MicroStation specific items "Undo", "Redo", and numerous others. Take this opportunity to look at the menus under Edit.

E.3.a. **Edit -> Undo** allows the user to undo the last MicroStation command. [Ctrl + Z]

E.3.b. **Edit -> Redo** negates the last undo operation. [Ctrl + R}

E.4. The Element menu contains the MicroStation specific items "Cells", "Dimension Styles", and several others. Take this opportunity to look at the menus under Element.

E.4.a. The **Element -> Cells** menu allows the user to attach and detach cell libraries (a file containing a collection of cells) and to select a cell for placement from among the cells in a cell library. A cell is a collection of one or more MicroStation elements that may be placed, manipulated, and deleted as one item. You may have only one cell library attached at any one time. Once a cell is placed, you no longer need the cell library attached because the cell is copied to the current design file. When shared cells are used, the definition of the cell is added to the design file only once at a location of (0,0), a scale of 1.0, and a rotation of 0.0 degrees and all other placements refer to the shared cell definition with specific location, scale, and rotation information. Shared cells thus use less disk space than normal cells. When normal cells are used, the cell is copied to the design file with specific location, scale, and rotation information applied when the copy is made.

E.4.b. The **Element -> Dimension Styles** menu provides for the selection of numerous attributed for dimensioning.

E.5. The Settings menu contains the MicroStation specific items "Design File...", "Levels", "Locks", "Snaps", "View Attributes", and several others. Take this opportunity to look at the menus under Settings.

E.5.a. The **Settings -> Design File...** menu allows the user to set or change many categories of items. We have used the Design File menu in section C above to set the Active Angle, Active Scale, Element Highlight Color, Drawing Pointer Color, Selection Set Color, Coordinate Readout, and Working Units.

E.5.b. The **Settings -> Level** menus allows the user to add and modify levels, to control which levels are displayed and hidden for each view (1-8 views may be on at any one time), and to control the active level (the level where all new user elements are placed). Level segregates the data by allowing the user to view or not view the data on individual levels. View levels can be applied to the single selected view, to multiple views, or to all views. The active level is indicated by the green color, the displayed level(s) are indicated by a blue background, and hidden level(s) are indicated by white backgrounds. The active level applies to all views. GEOPAK controls the level of each element placed by GEOPAK through the Design and Computation Manager. An organization can describe to GEOPAK the color, level, weight, and style for each GEOPAK object.

E.5.c. The **Settings -> Levels -> Manager** menu allows the user to add and modify levels. Each level has a user-defined name, an assigned level number, an optional description, and other characteristics.

E.5.d. The **Settings -> Levels -> Display** menu allows the user to control which levels are displayed and hidden for each view and to control the active level. View levels can be applied to the single selected view, to multiple views, or to all views. The active level is indicated by the green color, the displayed level(s) are indicated by a blue background, and hidden level(s) are indicated by white backgrounds.

E.5.e. **The Settings -> Locks** menu contains "Full", "Toggles", "Axis", "Grid", "Unit", "Association", "Level", "Graphic Group", "Text Node", "Isometric", "Annotation Scale", and "ACS Plane". Toggles opens a dialog box to set "Axis Lock", "Grid Lock", "Unit Lock", "Snap Lock", "Association Lock", "Level Lock", "Graphic Group", "Text Node Lock", "Isometric Lock", "Annotation Scale", and "ACS Plane". Full allows the user to specify additional parameters for some locks. Toggles allows the user to define whether the lock is active or not active. The locks controls how MicroStation uses tentative and data point buttons.

E.5.f. The **Settings -> Snaps** menu contains "Button Bar", "AccuSnap", "Multi-snaps", and a number of "snap" options. Snapping allows the user to pick a point along an existing element. The Button Bar creates a Snap Mode tool box which can be moved around the window or docked along any edge. The AccuSnap opens the AccuSnap Settings dialog box. The individual snap options are:

- The Near Point Snap uses the closest point to the cursor along the element
- The Midpoint Snap uses the midpoints of elements and segments of elements;
- The Center Snap uses the centers and centroids of elements;

- The Origin Snap uses the origins of cells;
- The Bisector Snap uses the midpoints of entire elements;
- Intersection Snap - intersect another element with the point of intersection at its starting or ending point;
- Tangent Snap - be tangent to another element;
- Tangent Point Snap - be tangent to another element with the point of tangency at its starting or ending point;
- Perpendicular Snap - be perpendicular to another element;
- Perpendicular Point Snap - be perpendicular to another element with the point of intersection at its starting or ending point;
- Parallel Snap - be parallel to another element;
- Point Through Snap - pass through a particular point on the design plane; and
- Point On Snap - start or end on another element.

E.5.g. The **Settings -> View Attributes** menu allows the user to control the viewing options for many items such as whether Construction elements are displayed or hidden, whether Fill is active or inactive (shapes are filled), whether the Grid is displayed or hidden, whether Line Styles are displayed, whether Line Weights are displayed, or whether Text is displayed. View Attributes can be applied to the single selected View Number or to all views.

E.6. The Tools menu contains the MicroStation specific items "Attributes", "Primary", "Standard", "Main", "Task Navigation", and numerous other tools. Take this opportunity to look at the menus under Tools.

E.6.a. If **Tools -> Attributes** does not have a check mark to its left then choose Attributes. The Attributes menu will appear. If the Attributes menu appears as below then dock the Attributes menu by moving the mouse over the words "Attributes" on the top edge of the Attributes menu, press and hold the left mouse button, drag the Attributes menu to the top of the MicroStation window to the leftmost position under File, and finally release the left mouse button. This action will dock the Attributes menu. The Attributes menu contains items for Active Level (Level 1 in the picture below), Active Color (2 in the picture below), Active Line Style (3 in the picture below), Active Line Weight (thickness) (4 in the picture below), and a visualization of the line using the active color, style, and weight. Each MicroStation element may have specific values of each of these attributes based upon the current settings when the element is added to the design file. There are tools to allow the user to change any of the attribute values. MicroStation applications like GEOPAK may set the level, color, style, weight, and class of an element as they add an element to the design file without affecting the current settings.

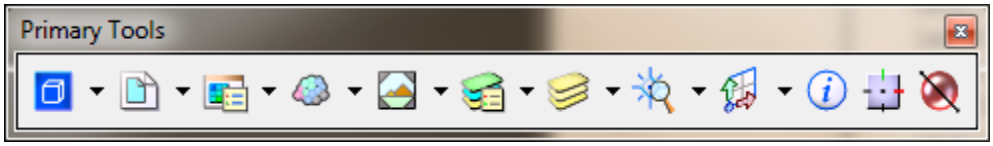
E.6.a.1. Active Level specifies one level or drawing plane. Level segregates the data allowing the user to view or not view the data. Individual levels may be viewed or hidden at any time.

E.6.a.2. Active Color specifies one of 255 colors (0-254) from an active Color Table. The value in the Color Table specifies a 24-bit true-color value (16,777,216 color combinations) to be associated with the Active Color.

E.6.a.3. Active Line Style specifies one of 8 predefined numeric styles (0-7), one of 25 predefined named styles (Border to Wide Dash), or one of a virtually unlimited number of Custom styles. Line Style defines the appearance of data (solid, dashed, dotted, etc.). The user may create his/her own Custom styles (Element -> Line Style -> Custom).

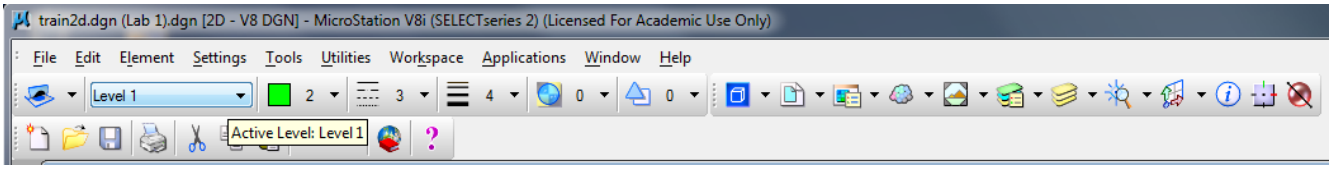
E.6.a.4. Active Weight specifies one of 16 predefined weights (0-15). Weight defines the thickness or number of pixels displayed on the screen for graphics. When plotting the design file, the Weight can be converted to a line thickness.

E.6.b. If **Tools -> Primary** does not have a check mark to its left then choose Primary. The Primary Tools menu will appear. If the Primary Tools menu appears as below then dock the Primary Tools menu by moving the mouse over the words "Primary Tools" on the top edge of the Primary Tools menu, press and hold the left mouse button, drag the Primary Tools menu to the top of the MicroStation window to the left of the Attributes menu, and finally release the left mouse button. This action will dock the Primary Tools menu. The Primary Tools menu contains, from left to right, items for Models, References (same as **File -> Reference**), Raster Manager, Point Clouds, Saved Views, Level Manager (same as **Settings -> Levels -> Manager**), Level Display (same as **Settings -> Levels -> Display**), Cells, Auxiliary Coordinates, Element Information; Toggle AccuDraw, and Pop Set Enable/Disable.



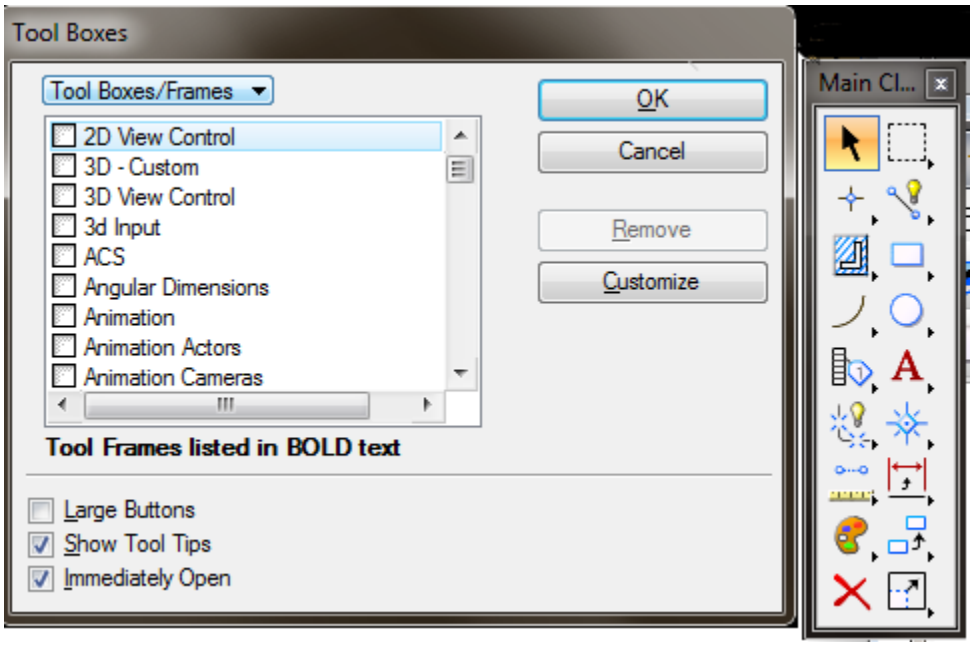
E.6.c. If **Tools -> Standard** does not have a check mark to its left then choose Standard. The Standard Tools menu will appear. If the Standard menu appears as below then dock the Standard menu by moving the mouse over the words "Standard" on the top edge of the Standard menu, press and hold the left mouse button, drag the Standard menu to the top of the MicroStation window to the left of the Primary Tools menu, and finally release the left mouse button. This action will dock the Standard menu. The Standard Tools menu contains, from left to right, items New, Open, Save, Print, Cut, Copy, Paste, Undo, Redo, Bentley Library, and Help.

When the Attributes, Primary Tools, and Standard menus are docked, they should look like the following:

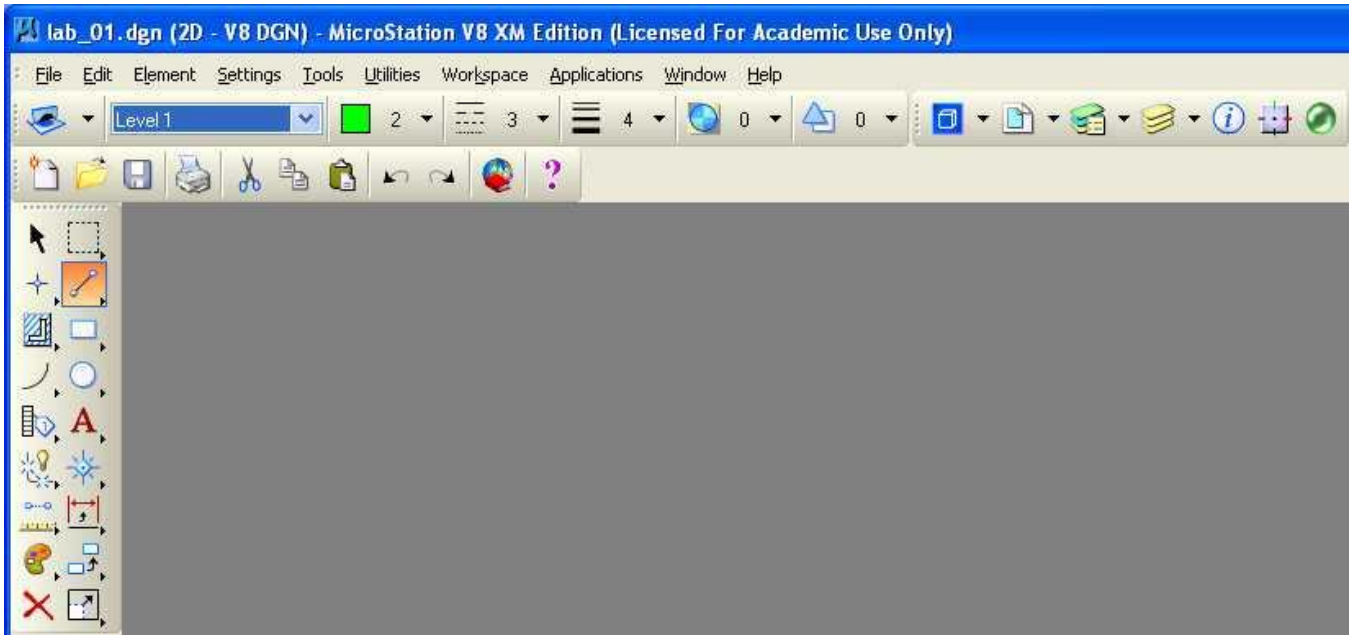


E.6.d. If **Tools -> Main -> Main** has a check mark to its left then uncheck Main. Choose **Tools -> Tool Boxes**. In the Tool Boxes dialog box, select Tool Boxes/Frames, check Main Classic, uncheck Large Buttons, and press the OK push button. The Main Classic menu will appear and will be herein

referred to as the Main menu. Adjust the appearance of the Main menu until it look like the figure below and dock the Main menu by moving the mouse over the words "Main Classic" on the top edge of the Main menu, press and hold the left mouse button, drag the Main menu to the left edge of the MicroStation window, and finally release the left mouse button.

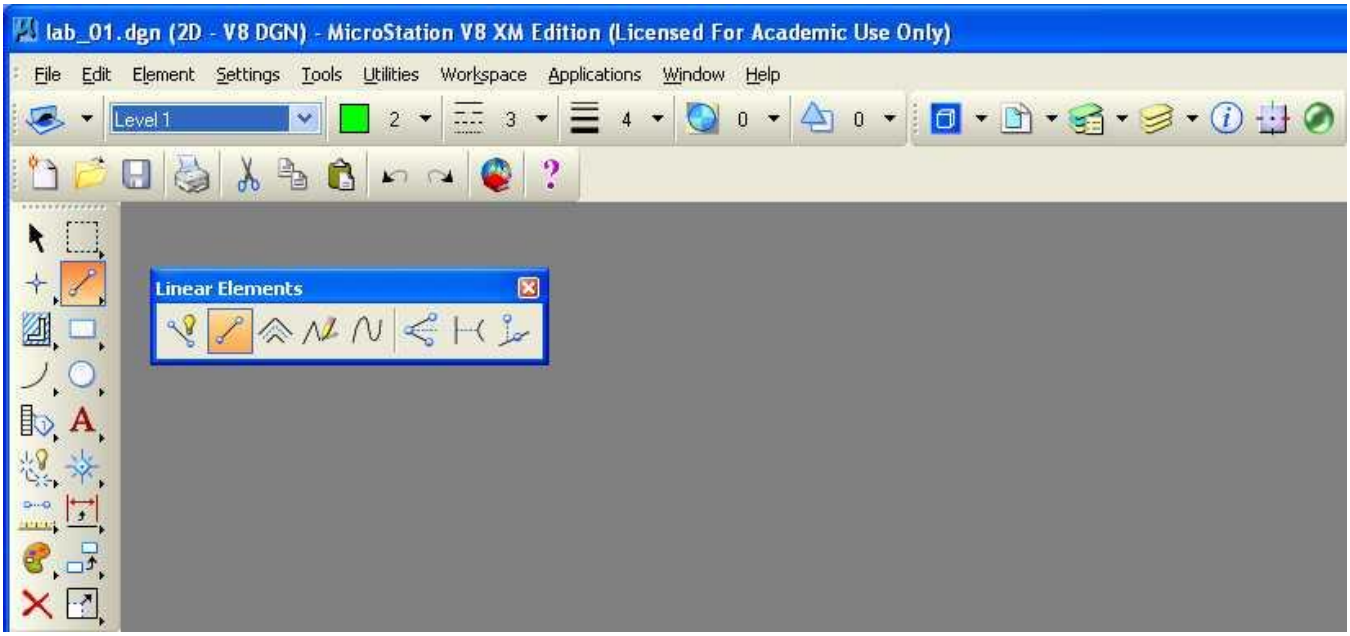


E.6.d.1. When the Main menu is docked, it should look like the following. The Main menu contains the MicroStation commands to add, modify, and delete elements and are (from left to right then top to bottom): the Element Selection tool, Fence commands, Points commands, Linear Elements (Lines) commands, Patterns commands, Polygons (Shapes) commands, Arcs commands, Ellipses (Circle) commands, Tags commands, Text commands, Groups commands, Cells commands, Measure commands, Dimension commands, Change Attributes commands, Manipulate commands, Delete Element command, and Modify commands. The icon for the most recently used command within a group is displayed. The background color for the active command is pink.



E.6.d.2. All the Main menu commands except the Element Selection and the Delete Element commands can be expanded to show all available commands in the group by moving the mouse over the Main menu command, press and hold the left mouse button, move the mouse horizontally then vertically over the desired command, and finally release the left mouse button. The name of the command will appear in the message box at the bottom of the MicroStation window after the command has been chosen.

E.6.d.3. All the Main menu commands except the Element Selection and the Delete Element commands can be opened as a separate tool box to show all available commands in the group by moving the mouse over the Main menu command, press and hold the left mouse button, move the mouse horizontally then choose Open as ToolBox. The command menu may be docked if desired. The following is the Linear Elements menu.



E.7. The Utilities menu contains the MicroStation specific items "Key-in", "MDL Applications", and several others. Take this opportunity to look at the menus under Utilities.

E.7.a. The **Utilities -> Key-in** dialog box allows the user to enter a MicroStation command, to select a MicroStation command from the hierarchical list of commands, or to select a MicroStation command from the list of recent key-in commands. In the key-in field, you may enter up-arrow and down-arrow keys for command recall and selection and enter the home, end, delete, backspace, left-arrow, and right-arrow keys for command editing. To paste text into the key-in field from the Windows paste buffer, move the cursor to the key-in field, press and hold the shift key, and press the insert key.

E.7.b. The **Utilities -> MDL Applications** dialog box allows the user to load (start), unload (stop), and get additional information about MDL Applications. GEOPAK is an MDL Application.

E.8. The Workspace menu contains the MicroStation specific items "Configuration...", "Button Assignments...", and several other items. Take this opportunity to look at the menus under Workspace.

E.8.a. The Configuration dialog box allows the user to specify many MicroStation parameters. Many of these configuration variables are set when you start MicroStation.

E.8.b. The Button Assignments dialog box allows the user to specify the association between the buttons on the mouse and the meaning to MicroStation. The Data button specifies a coordinate to MicroStation (or if the Tentative button was last used then accepts the snapped, calculated coordinate) and is normally the left button on the mouse. The Tentative button specifies a coordinate to MicroStation that causes MicroStation to search the design file for an element close to the coordinate specified, calculate a coordinate based upon the current snap feature, move an enlarged cursor to the calculated coordinate, and highlight the selected element. If the snapped, calculated coordinate is not acceptable, the user may enter additional Tentative buttons until an acceptable coordinate is displayed. To accept the Tentative button snapped, calculated coordinate, the user would enter a single Data button (the location of the cursor for the Data button is not pertinent). The Tentative button is normally the center button on a three-button mouse, the wheel button on a two-button mouse with a wheel, or a left button - right button chord (left and right button pressed at the same time) on a two-button mouse. The Reset button specifies a reset or reject action to MicroStation and is normally the right button on the mouse. The definition of the Command button is not important because MicroStation interprets any button on a dialog box to be a Command button. If the buttons are not assigned the way that you want them, select a button from the list and in the Button Definition Area, press the mouse button or combination of Alt keys and mouse buttons that you want. When completed, press the OK push button.

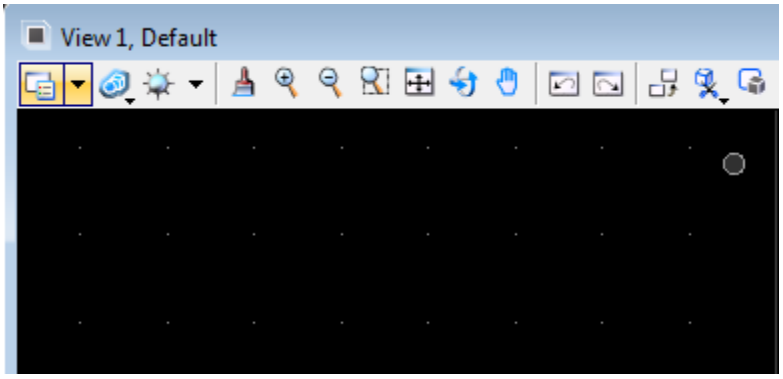
E.9. The Applications menu contains menus added by MicroStation MDL Applications and MBE Applications. On some systems, "Applications" may not be displayed. GEOPAK ROAD may be listed on the Applications menu. Take this opportunity to look at the menus under Applications.

E.10. The Window menu contains the MicroStation specific items "Views" and several others. Take this opportunity to look at the menus under Window. MicroStation can have up to 8 windows or views open simultaneously. Each window or view has its own size (height and width), location within the MicroStation window, levels to display or hide (Settings -> Levels -> Display), view attributes (Settings -> View Attributes), panning, zooming, rotation, and orientation (for 3D files: top, bottom,

left, orthogonal, etc.). Choose Window -> Views; if 1 (for view 1) does not have a check mark to its left then select 1 (view 1 will be Opened) and if any of 2 through 8 has a check mark to its left then select each one (the view will be Closed).

E.11. The Help menu contains the MicroStation specific items to assist the user in using and finding online information about MicroStation. Take this opportunity to look at the menus under Help.

E.12. Each MicroStation View has a bar across the top border and view commands below the top border. Take this opportunity to look at the borders for Window 1.



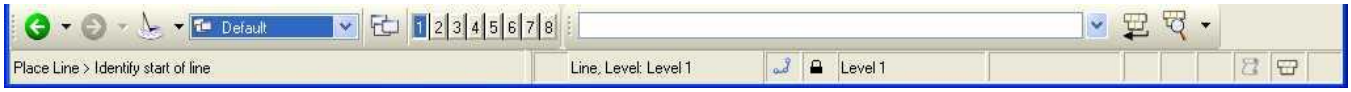
E.12.a. The bar across the top border of a MicroStation view contains the view name on the left and three icons on the right. The three icons are, from left to right, the Collapse icon, the Size icon (a one-window icon  means the MicroStation view will be enlarged to fit the MicroStation window whereas a two-window icon  means the MicroStation view will be reduced to its previous size), and the Close icon. When the MicroStation view is displaying the one-window Size icon, the MicroStation view may be moved or re-sized. Pressing and holding the left mouse button on the top bar and then moving the mouse will cause the view to be moved within the MicroStation window. Pressing and holding the left mouse button on any of the four corners of the MicroStation view will re-size both the horizontal and vertical dimensions of the MicroStation view. Pressing and holding the left mouse button on any of the four edges of the MicroStation view will re-size either the horizontal and vertical dimensions of the MicroStation view.

E.12.b. The view commands applies only to the single MicroStation view and contains, from left to right:

- View Attributes icon
- Update View [paint brush] - paint or re-draw
- Zoom In ["+" sign] - increase magnification
- Zoom Out ["-" sign] - decrease magnification
- Window Area [magnifying glass] - zoom in by rectangle
- Fit View [vertical and horizontal arrows] - view all elements
- Rotate View [circular arrows] – change orientation of view
- Pan View icon [hand] – move viewing area horizontally and vertically
- View Previous [left arrow]
- View Next [right arrow]

- Copy View
- Clip Volume
- Clip Mask

E.13. The message fields within the MicroStation dialog box are located at the bottom of the MicroStation dialog box on the left side. The field with "Place Line > Identify start of line" normally contains the MicroStation command name ("Place Line") and the prompt ("Identify start of line") for the next action to take for the command. The field with "Line, Level=1" normally contains MicroStation status information.



The Active Snap Mode button  **gives the user quick access to the Snaps menu. The Active Locks button**  **gives the user quick access to the Locks menu. The Active Level button** 

gives the user quick access to the Active Level menu.

F. Exit MicroStation.

F.1. Choose MicroStation File -> Compress -> Design.

F.2. Choose MicroStation File -> Save Settings.

F.3. Choose MicroStation File -> Exit.

G. Reboot the computer.

CE367G Geometric Design Lab web page

CE 367G Geometric Design Lab- Lab 02
Leg Centerline and Lanes using MicroStation

Objective: Learn the basics of MicroStation required to operate GEOPAK by drawing a simple leg centerline and lanes.

Activity: Start MicroStation and create a 2D design file " Z:\ MicroStation\lab_02.dgn" using the seed file " Z:\ MicroStation\train2d.dgn" ; Use MicroStation to Draw a Leg Centerline; Use MicroStation to copy the centerline 12 feet parallel both above and below the centerline for lane edges; Change the lane edge attributes to color green (color=2) and solid style (style=0); Place a landscape oriented rectangle centered around the roadway in 8.5" by 11" proportion (2070 feet by 1583 feet); Place the title "Lab Assignment 02" centered at the top and your name, class name, and assignment due date in the lower right at a text height and width of 75 feet; Compress the MicroStation design file and Save the MicroStation design file settings; Select the black and white laser printer as the default printer; Place a fence around the rectangle and print the drawing; Exit MicroStation; and Reboot the computerReboot the computer.

Background: *MicroStation* is a Computer Aided Drafting (CAD) software package. *GEOPAK* is an MDL application that runs on MicroStation. Some knowledge of MicroStation is required to operate GEOPAK. Intersection analysis begins by defining the geometry of the intersection. A *circular fillet* is an arc of a circle that is tangent to two intersecting lines.

A. Start MicroStation and create a 2D design file " Z:\ MicroStation\lab_02.dgn" using the seed file " Z:\ MicroStation\train2d.dgn".

B. Use MicroStation to Draw a Leg Centerline.

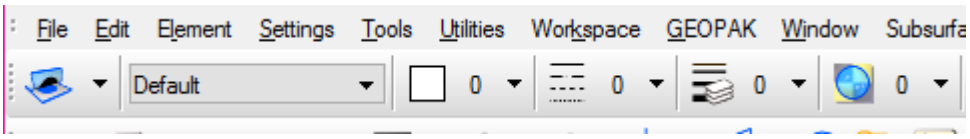
B.1. Set the element attributes.

B.1.a. Select the **Active Level** icon (leftmost icon) from the MicroStation Primary Tools menu at the top and choose **Default** (level=**Default**).

B.1.b. Select the **Active Color** icon (next icon to the right) from the MicroStation Primary Tools menu at the top and choose the **yellow** color (color=**4**).

B.1.c. Select the **Active Style** icon (next icon to the right) from the MicroStation Primary Tools menu at the top and choose **dash-dot** style (style=**4**).

B.1.d. Select the **Active Weight** icon (next icon to the right) from the MicroStation Primary Tools menu at the top and choose weight **0** (weight=**0**).

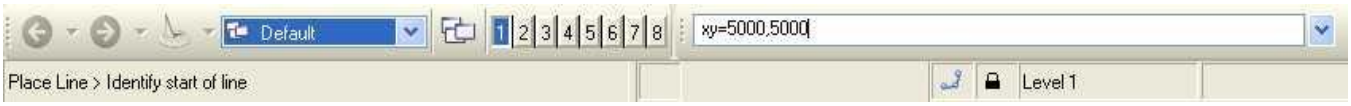


B.2. Place leg centerline.

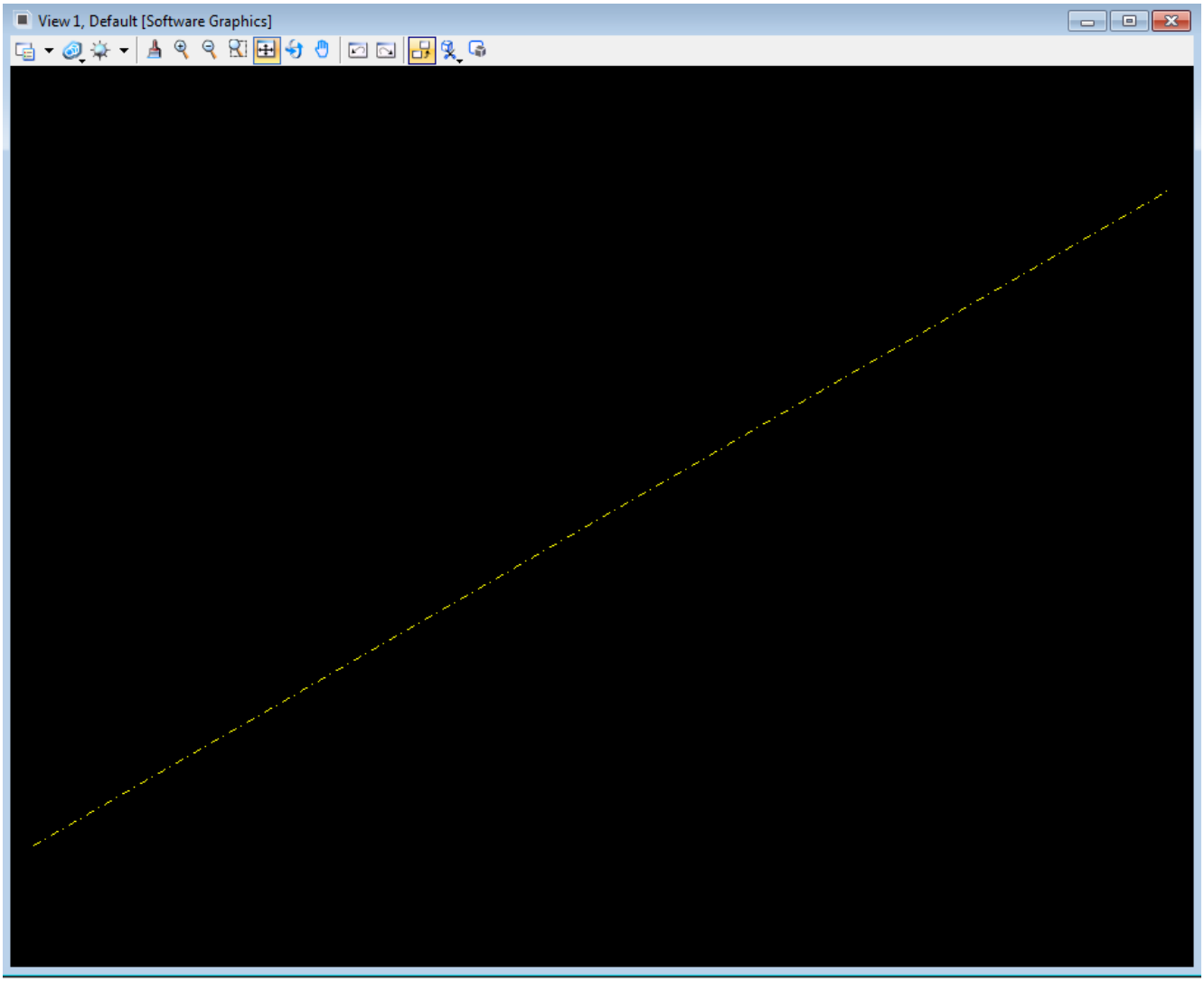
B.2.a. **Place a 600 foot line at 30 degrees**. From the MicroStation Main Tool menu, select the **Linear Elements** palette (row 2 right icon) and open it as a tool box in the MicroStation View 1 window.

B.2.b. From the Linear Elements palette, choose the **Place Line** icon (2nd from left on the top row)  . From the Place Line dialog box, select **Length** to be active (a check mark will appear), enter a value of **600** feet (enter the tab character to set the number), select **Angle** to be active (a check mark will appear), and enter a value of **30** degrees (enter the tab character to set the number).

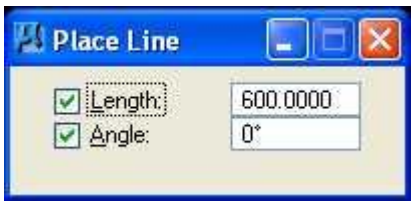
B.2.c. In the MicroStation **Key-in** field, enter "**xy=5000,5000**" plus a carriage return or the **Enter** key. This entry tells MicroStation that the line should start at an x-coordinate of 5000 feet and y-coordinate of 5000 feet.



B.2.d. In Window 1, press the **Fit View** icon (the 5th icon from the left)  ; the line should be visible.

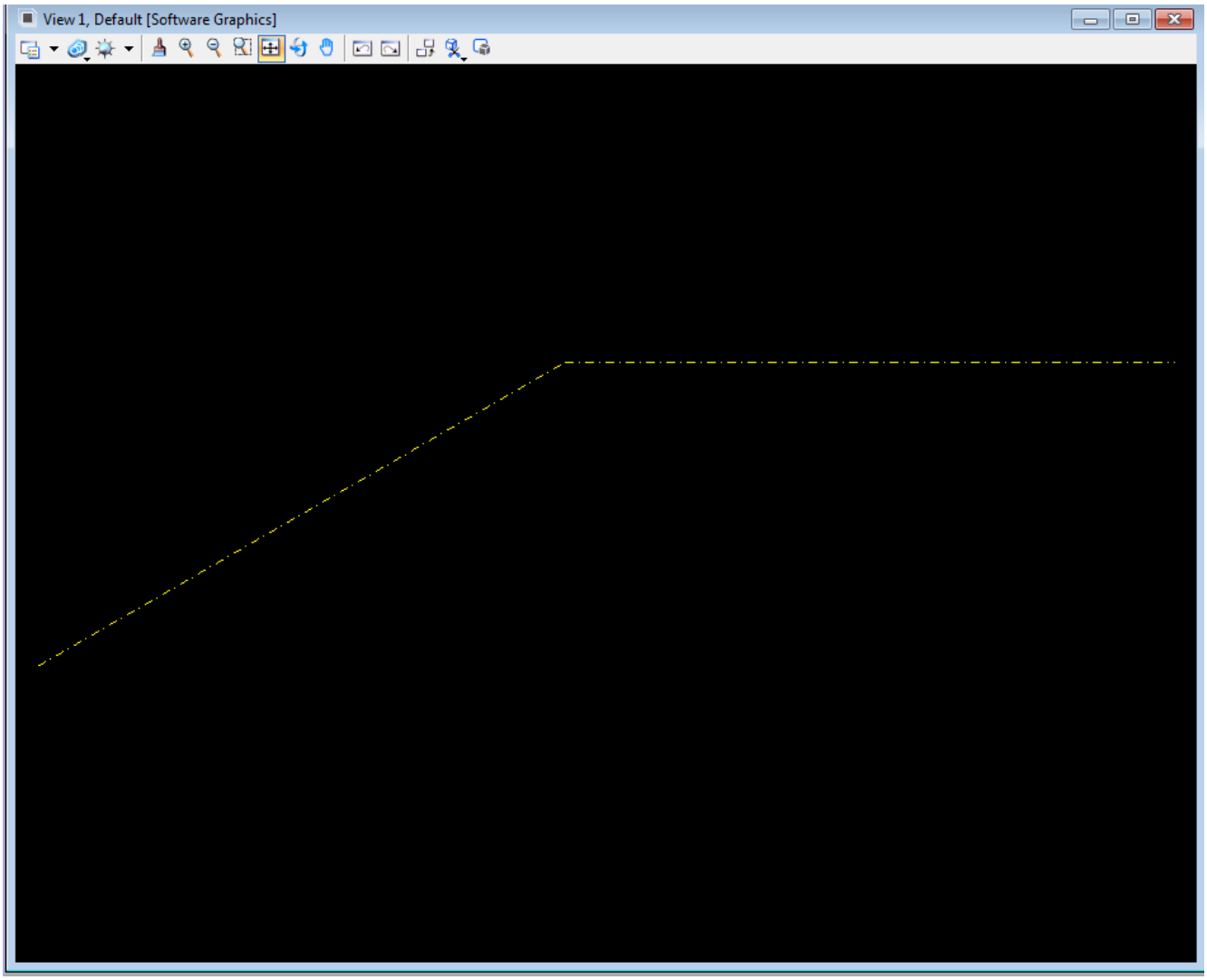


B.2.e. **Place a 600 foot line at 0 degrees**. In the MicroStation window, choose **Settings -> Snaps**. If **Keypoint** does not have a dot to its left then select Keypoint. In the Inform Message field,  should be displayed. From the **Place Line** dialog box, select **Length** to be active, enter a value of **600** feet, select **Angle** to be active, and enter a value of **0** degrees.



B.2.f. Move the cursor in Window 1 near the **top-right end of the previously placed line** and press the **Tentative** button. In the Status Message field, "5519.6152, 5300.0000" should be displayed, a larger cursor should be positioned on the top-right end of the previously placed line, and the previously placed line should be highlighted in magenta (if this did not occur, choose Workspace -> Button Assignments and set the tentative button to the middle button and try again). Now press the **Data**

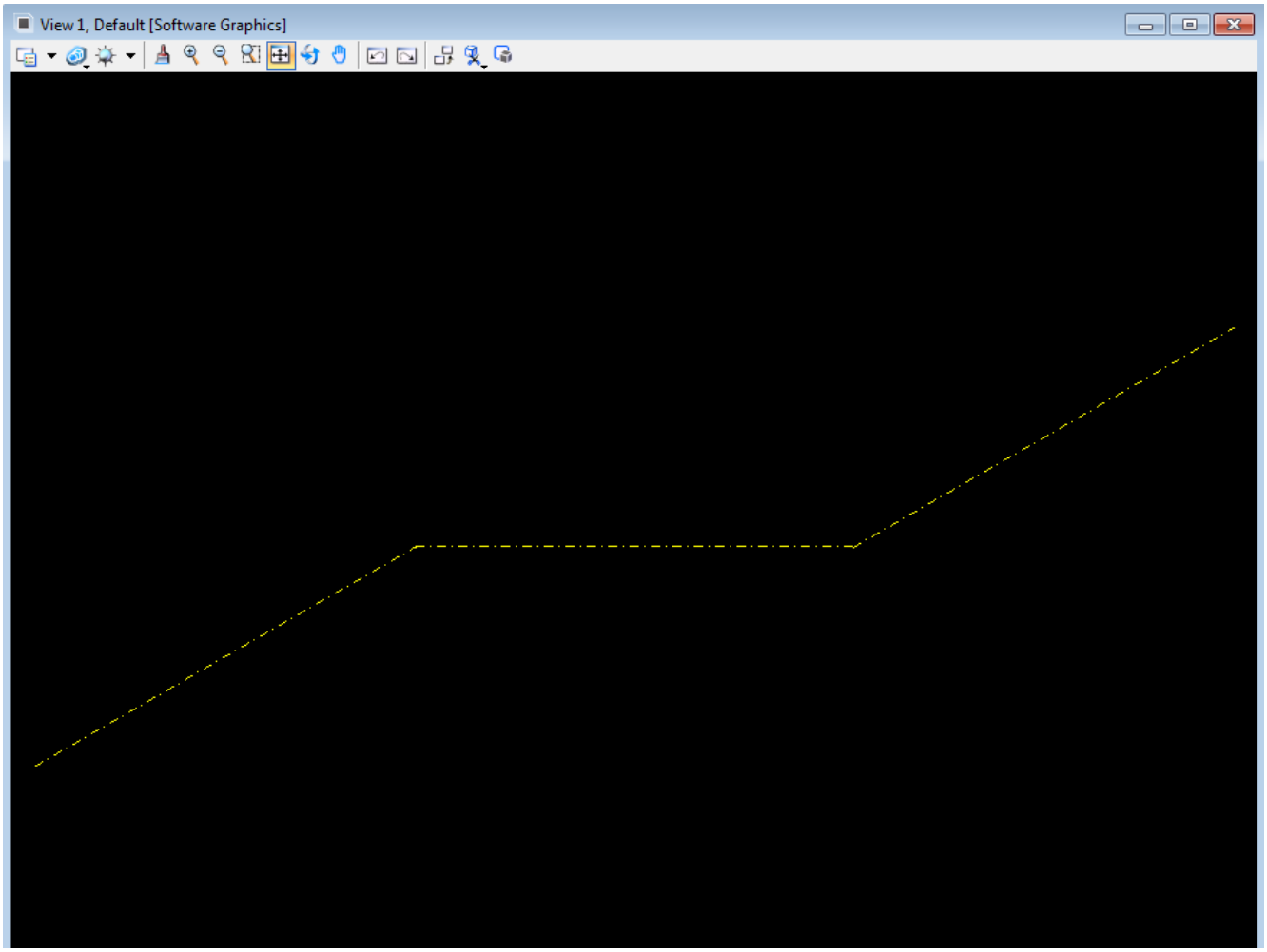
button to accept this tentative point. In Window 1, press the **Fit View** icon  ; both lines should be visible.



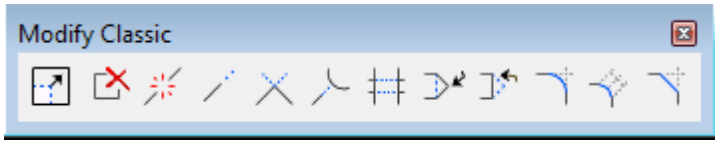
B.2.g. **Place a 600 foot line at 30 degrees**. From the **Place Line** dialog box, select **Length** to be active, enter a value of **600** feet, select **Angle** to be active, and enter a value of **30** degrees.

B.2.h. Move the cursor in Window 1 near the **top-right end of the previously placed line** and press the **Tentative** button. In the Status Message field, "6119.6152, 5300.0000" should be displayed, a larger cursor should be positioned on the top-right end of the previously placed line, and the previously placed line should be highlighted in magenta. Now press the **Data** button to accept this tentative

point. In Window 1, press the **Fit View** icon  ; all three lines should be visible. Close the Linear Elements palette by selecting the "X" in the upper right corner.

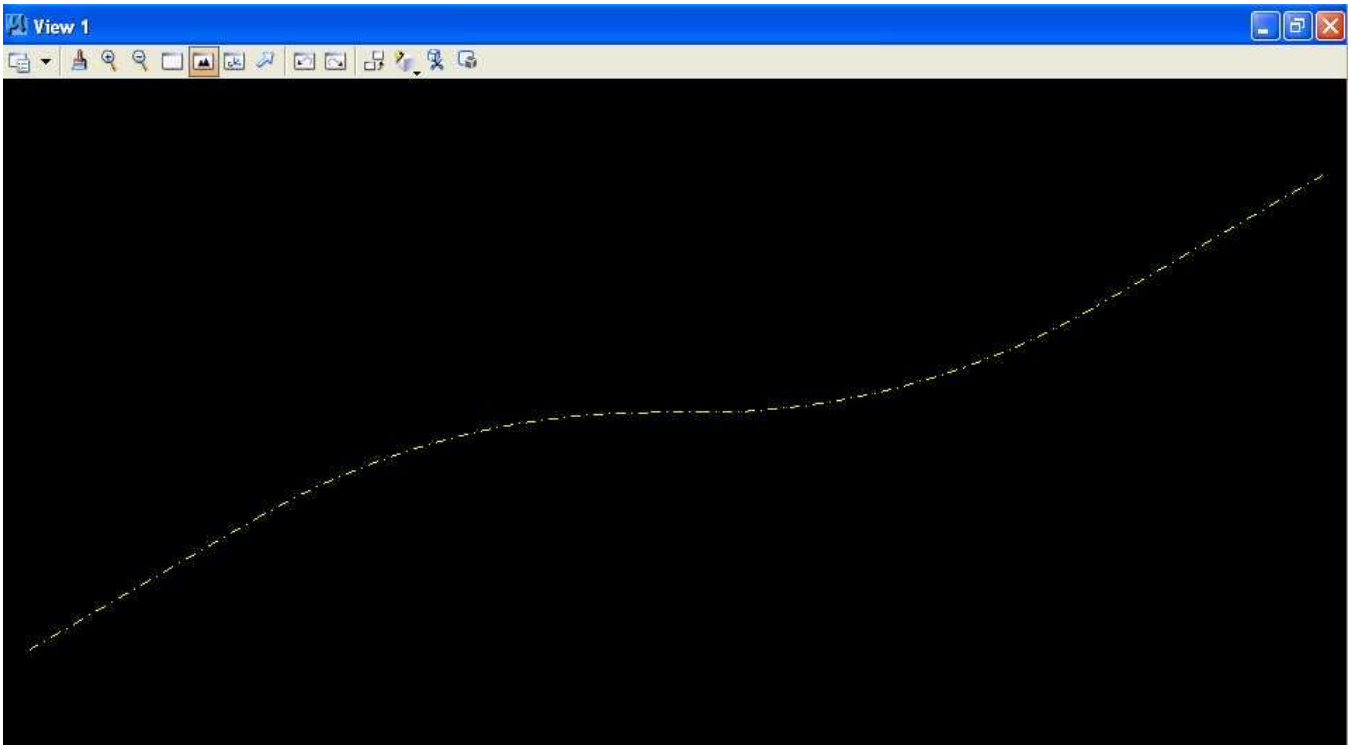


B.2.i. **Place a 1000 foot radius fillet with truncate between the lines 1 and 2 and lines 2 and 3**. From the MicroStation Main Tool menu, select the **Modify** palette (bottom row right icon) and open it as a tool box in the MicroStation View 1 window.



B.2.j. From the Modify palette, choose the **Construct Circular Fillet** icon (third to last icon)  . From the Construct Circular Fillet dialog box, enter a **Radius** of **1000** feet and set the **Truncate** option to **Both**.

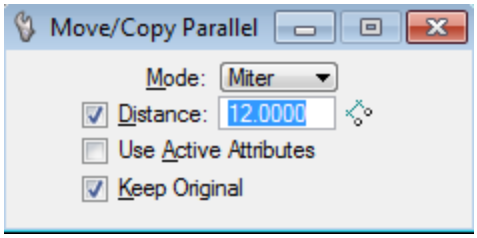
B.2.k. Move the cursor over the **1st line** and press the **Data** button (MicroStation will highlight the 1st line); then move the cursor over the **2nd line** and press the **Data** button (MicroStation will highlight the 2nd line and construct and highlight a 1000 foot circular fillet); and finally press the **Data** button **anywhere** to accept the fillet. Move the cursor over the **2nd line** and press the **Data** button (MicroStation will highlight the 2nd line); then move the cursor over the **3rd line** and press the **Data** button (MicroStation will highlight the 3rd line and construct and highlight a 1000 foot circular fillet); and finally press the **Data** button **anywhere** to accept the fillet. In Window 1, press the **Update View** icon  ; all three lines and both arcs of a circle should be visible. **Close** the Modify palette by selecting the "X" in the upper right corner.



C. Use MicroStation to copy the centerline 12 feet parallel both above and below the centerline for lane edges.

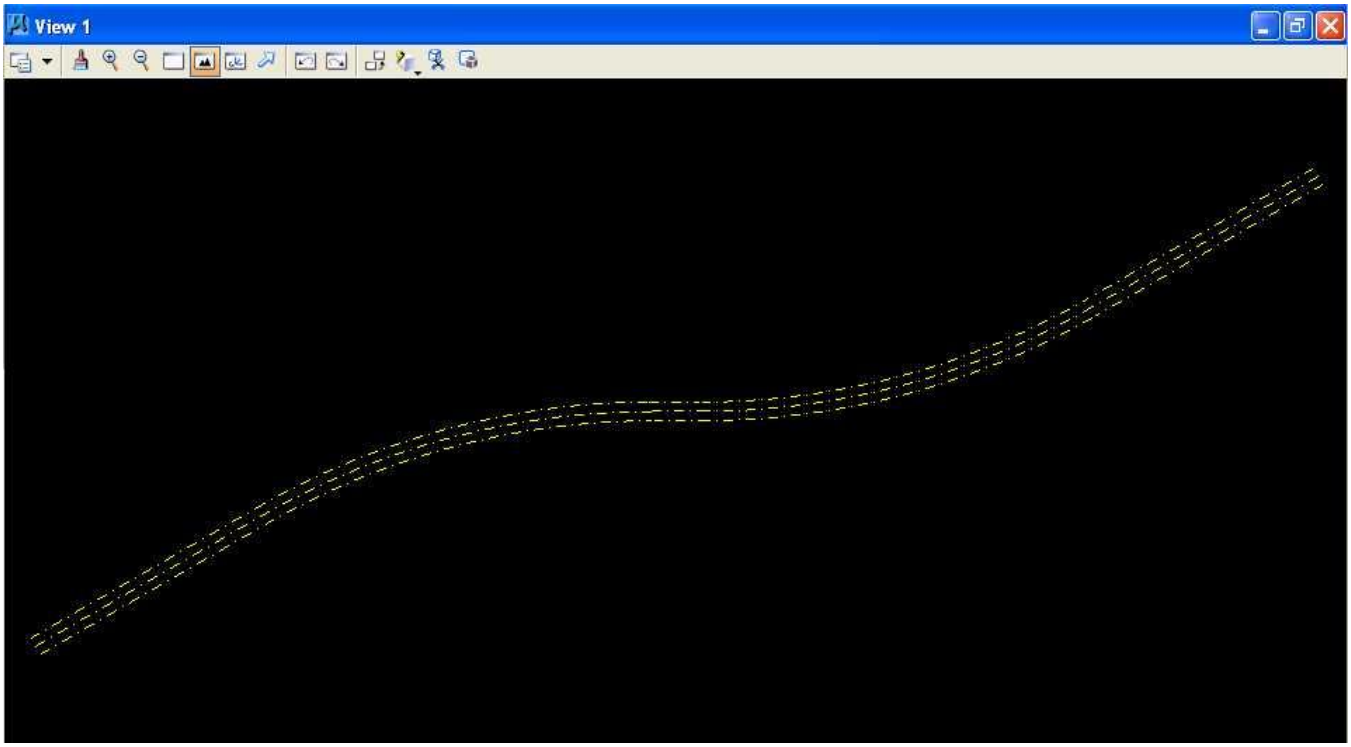
C.1. From the MicroStation tool palette, select the **Manipulate** palette (next to the bottom row right icon) and open it as a tool box in the MicroStation View 1 window.

C.2. From the Manipulate palette, choose the **Move Parallel** icon (3rd icon from the left)  . From the Move/Copy Parallel dialog box, select **Mode: Miter**, select **Distance** to be active (a check mark will appear) and enter a value of **12** feet, select **Keep Original** to be active (a check mark will appear).



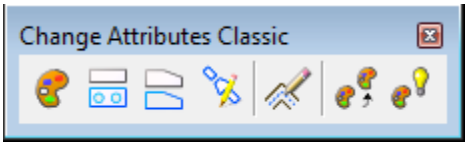
C.3. Move the cursor **over** the **1st line** and press the **Data** button (MicroStation will highlight the line), then move the cursor **above** the **1st line** and press the **Data** button (MicroStation will copy the 1st line 12 feet parallel and above the 1st line), then move the cursor **below** the **1st line** and press the **Data** button (MicroStation will copy the 1st line 12 feet parallel and below the 1st line), and finally enter a **Reset** button (right button).

C.4. **Repeat** Step C.3 for the **1st arc**, the **2nd line**, the **2nd arc**, and the **3rd line**; then **close** the Manipulate palette by selecting the "X" in the upper right corner.

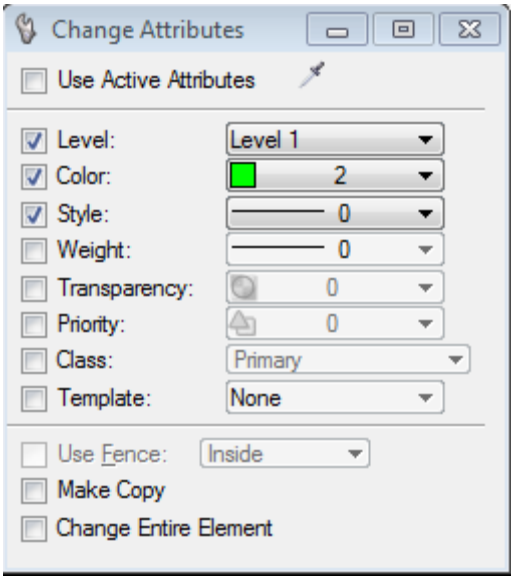


D. Change the lane edge attributes to color green (color=2) and solid style (style=0).

D.1. From the MicroStation tool palette, choose the **Change Attributes** palette (next to the bottom row left icon) and open it as a tool box in the MicroStation View 1 window.

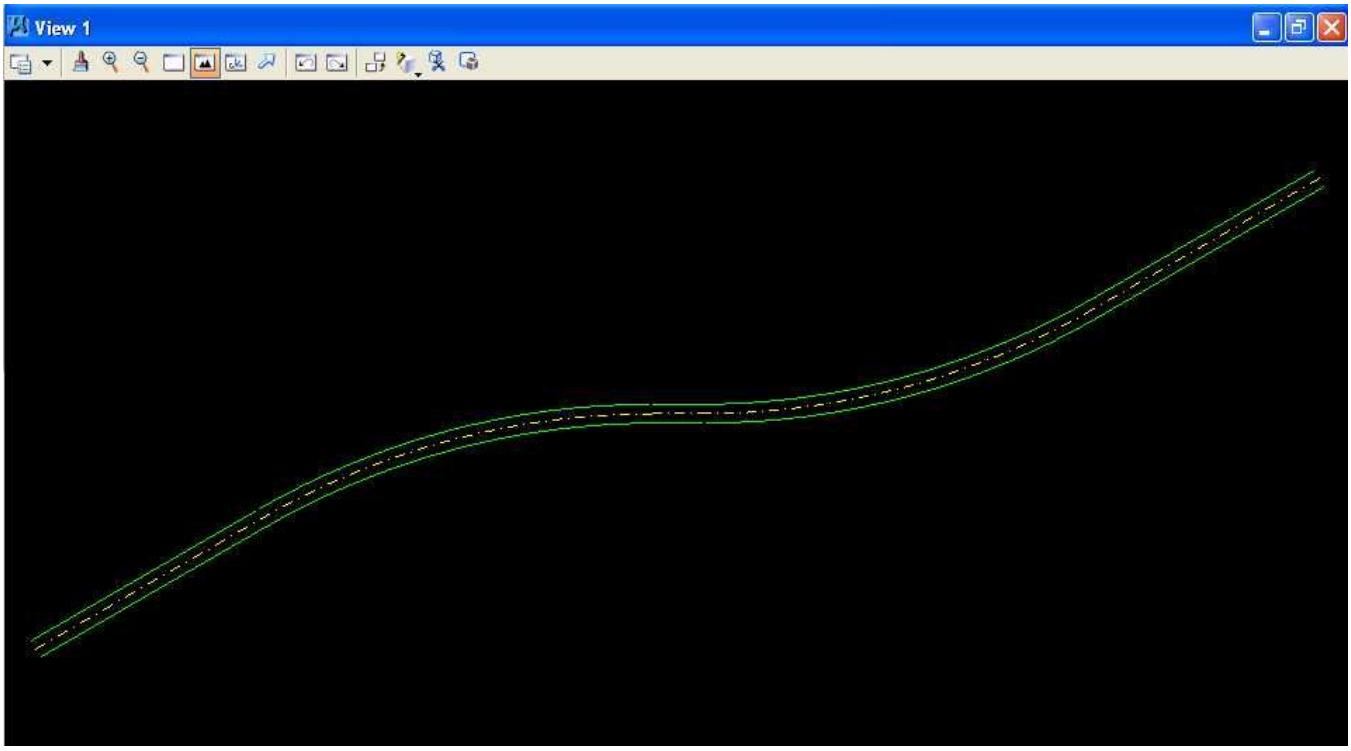


D.2. From the Change Attributes palette, choose the **Change Element Attributes** icon (leftmost icon)  . From the Change Element Attributes dialog box, select **Level** to be active (a check mark will appear) and choose **Default**, select **Color** to be active (a check mark will appear) and choose the **green** color (color=**2**), select **Style** to be active (a check mark will appear) and select **solid** (style=**0**), and make sure that Use Active Attributes, Level, Weight, and Class are not active.



D.3. Move the cursor over the **1st line copied parallel 12 feet above** and press the **Data** button (MicroStation will highlight the line) then move the cursor over the **1st line copied parallel 12 feet below** and press the **Data** button (MicroStation will change the attributes of the previously selected line and highlight the newly selected line).

D.4. **Repeat** Step D.3 for **all other arcs and lines except the centerline elements** and finally press a **Data** button **anywhere** to accept the last element; then **close** the Change Attributes palette by selecting the "X" in the upper right corner.



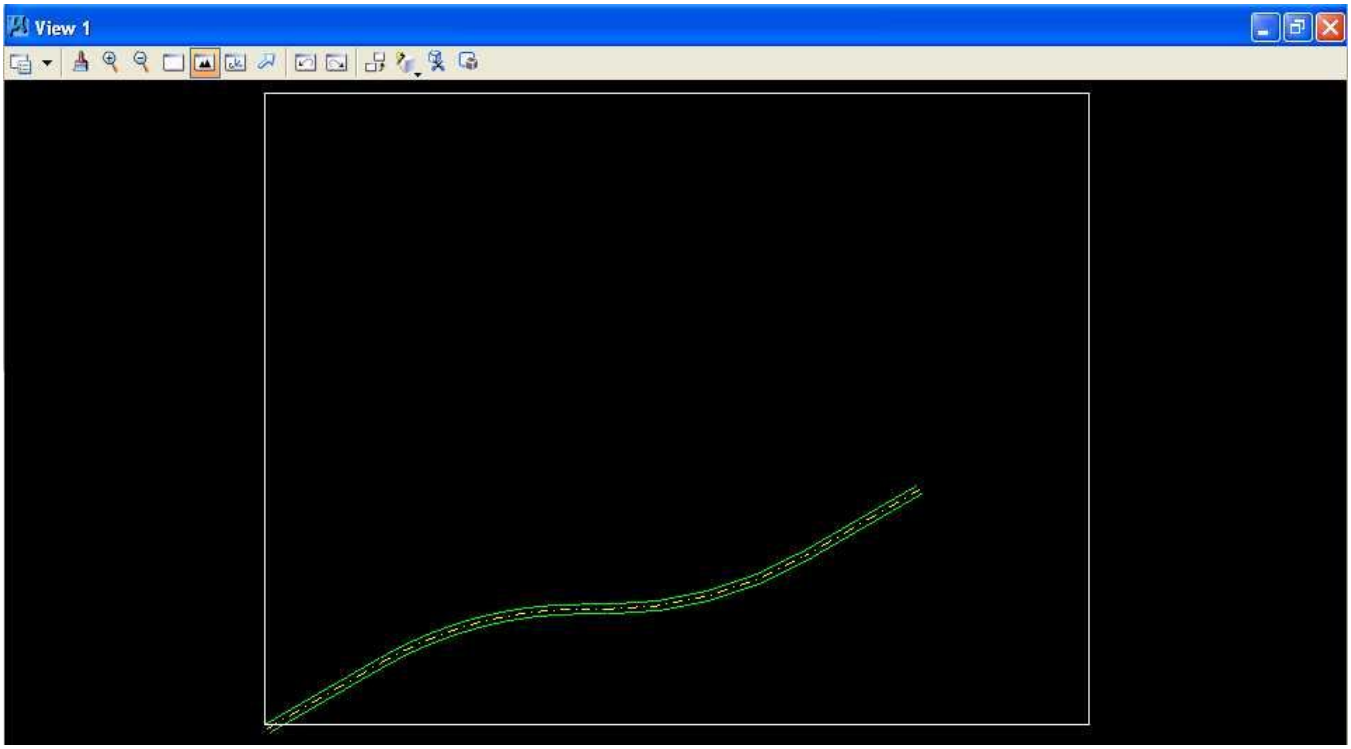
E. Place a landscape oriented rectangle centered around the roadway in 8.5" by 11" proportion (2070 feet by 1583 feet).

E.1. From the MicroStation tool palette, choose the **Polygons** palette (3rd row right icon) and open it as a tool box in the MicroStation View 1 window.

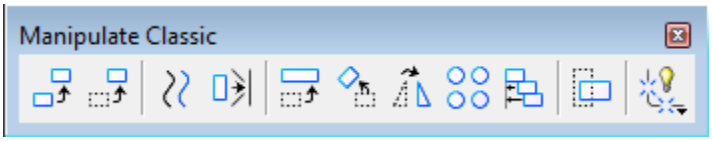
E.2. From the Polygons palette, choose the **Place Block** icon (leftmost) . From the Place Block dialog box, choose **Method = Orthogonal**, **Area = Solid**, and **Fill Type = None**. Select the **Active Color** icon (leftmost icon) from the MicroStation Primary Tools menu at the top and choose the **white** color (color=**0**); this will set **Fill Color = 0** in the Place Block dialog box. Select the **Active Style** icon (3rd icon from the left) from the MicroStation Primary Tools menu at the top and choose **solid** style (style=**0**).

E.3. Move the cursor to the **left edge of the leftmost line** and enter a **Data** button (left button), then in the MicroStation **Key-in** field enter "**dx=2070,1583**" to place a data point 2070 feet in the x

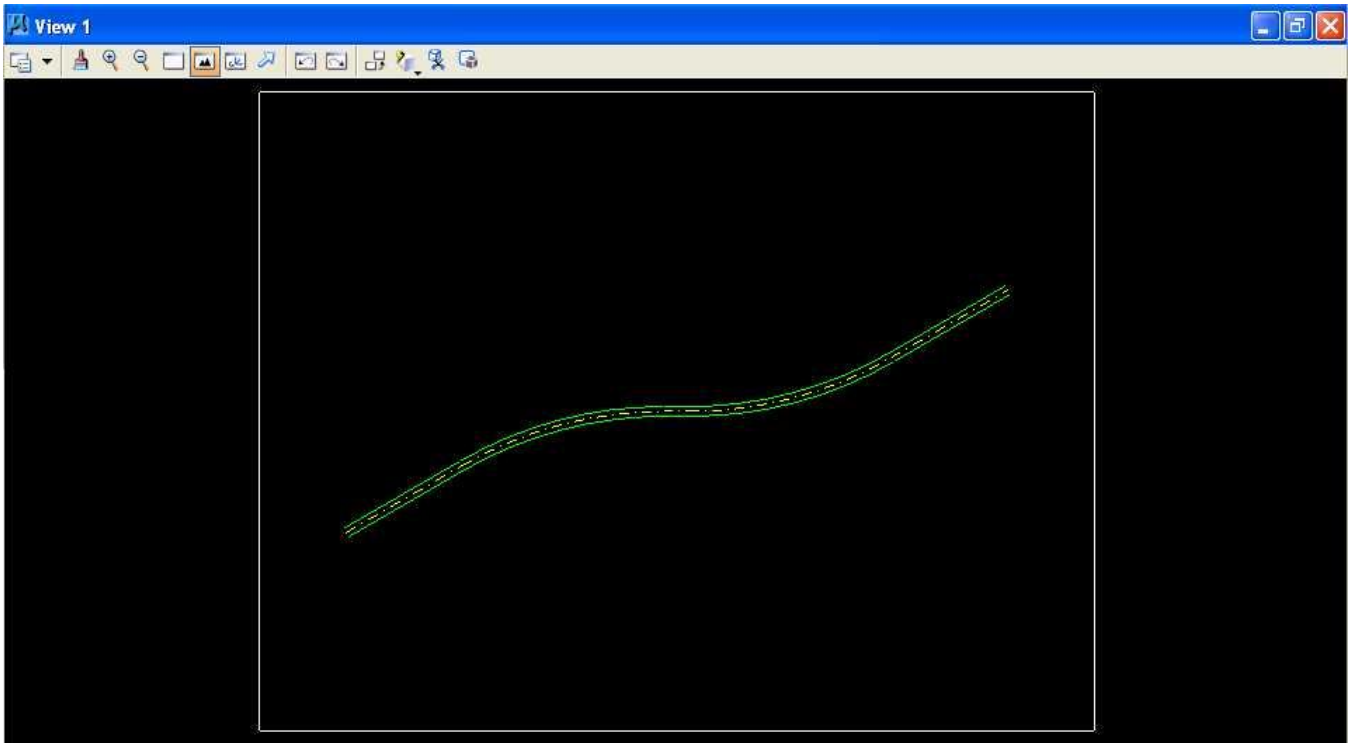
direction and 1583 feet in the y direction from the current data point and press the carriage return or **Enter** key; then **close** the Polygons palette by selecting the "X" in the upper right corner; and finally choose the **Fit View** icon  .



E.4. From the MicroStation tool palette, choose the **Manipulate** palette (next to the bottom row right icon) and open it as a tool box in the MicroStation View 1 window.



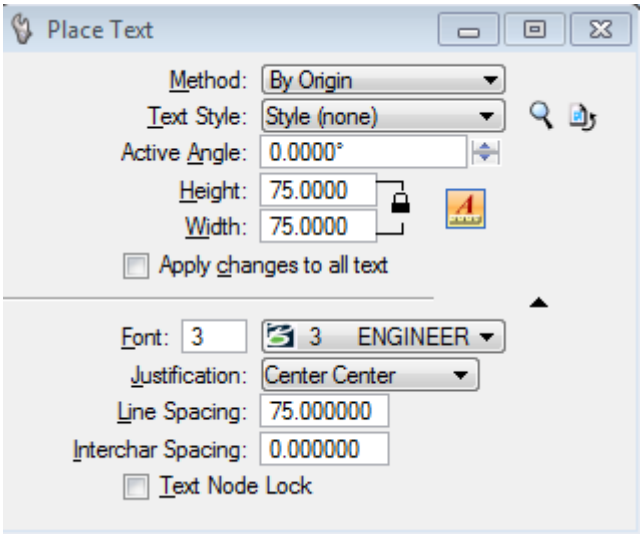
E.5. From the Manipulate palette, choose the **Move** icon (2nd icon from the left)  . Select the **rectangle** placed in Step E.3 and move it until the road is approximately centered; then **close** the Manipulate palette by selecting the "X" in the upper right corner; and finally choose the **Fit View** icon  .



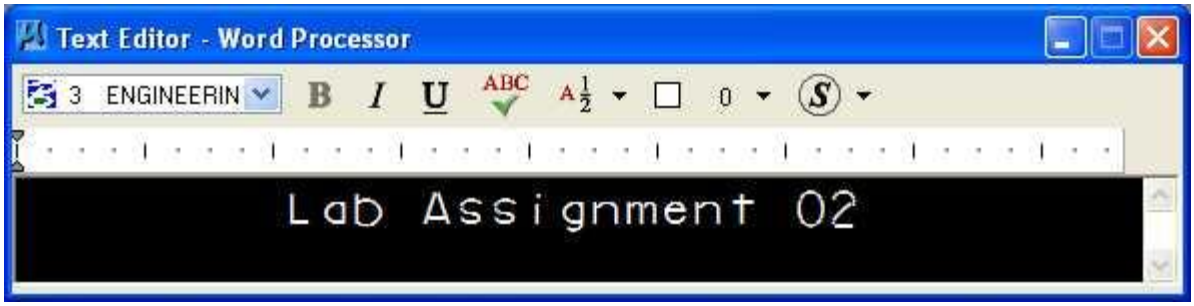
F. Place the title "Lab Assignment 02" centered at the top and your name, class name, and assignment due date in the lower right at a text height and width of 75 feet.

F.1. From the MicroStation tool palette, choose the **Text** palette (5th row right icon) and open it as a tool box in the MicroStation View 1 window.

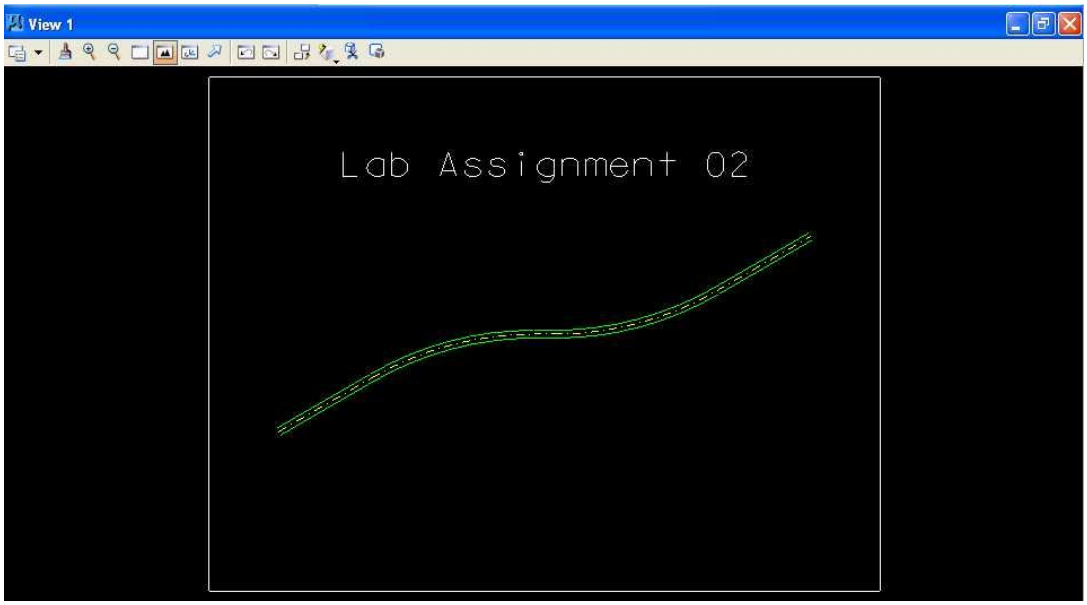
F.2. From the Text palette, choose the **Place Text** icon (leftmost icon)  . In the **Place Text** dialog box, set **Method = By Origin**, **Text Style = none**, **Active Angle = 0**, **Height = 75** feet, **Width = 75** feet, set **Font = 3 (Font=ENGINEERING), Justification = Center Center**, **Line Spacing = 75** feet, and **Interchar Spacing = 0**.



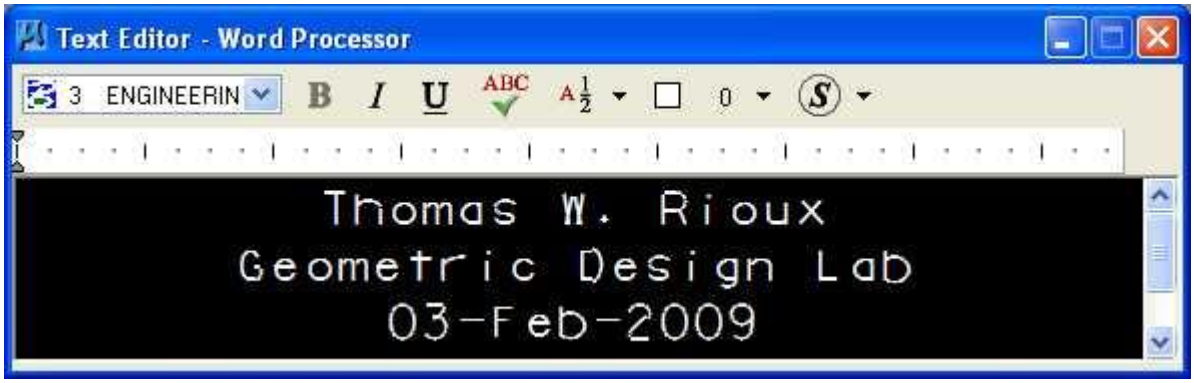
F.3. In the **Text Editor - Word Processor** dialog box, enter "**Lab Assignment 02**".



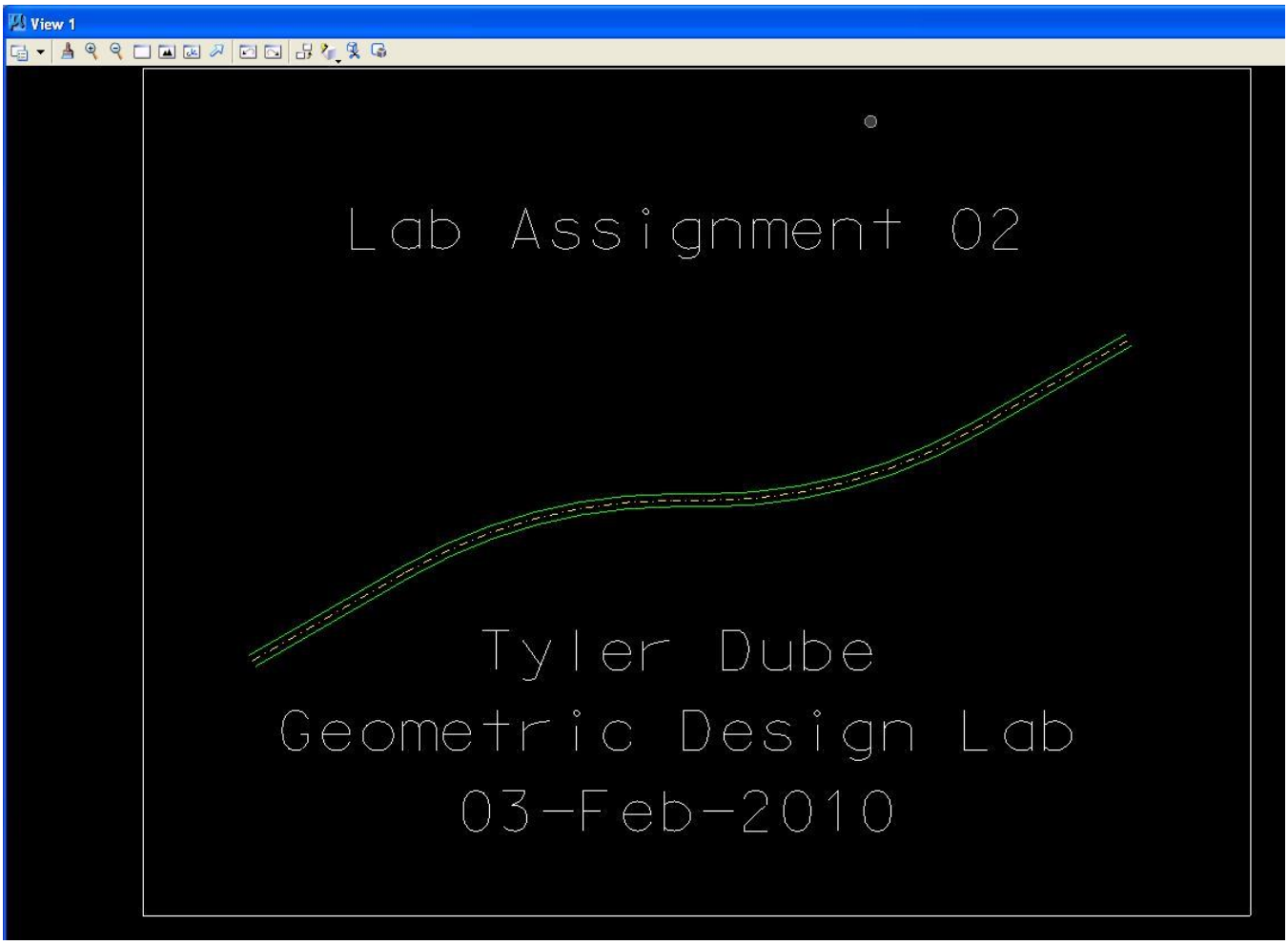
F.4. Move the cursor until the text is centered near the top of the rectangle, and enter a **Data** button (left button).



F.5. From the **Text Editor - Word Processor** dialog box, enter your **name**; the carriage return or **Enter** key; " **Geometric Design Lab Spring 2011Geometric Design Lab**"; the carriage return or **Enter** key; and the **assignment due date** in day-month-year (03-Feb-201003-Feb-2010) notation.



F.6. Move the cursor until the text is near the **bottom right of the rectangle**, enter a **Data** button (left button), **close** the Text Editor - Word Processor dialog box by selecting the "X" in the upper right corner, and finally **close** the Text palette by selecting the "X" in the upper right corner.



G. Compress the MicroStation design file and Save the MicroStation design file settings.

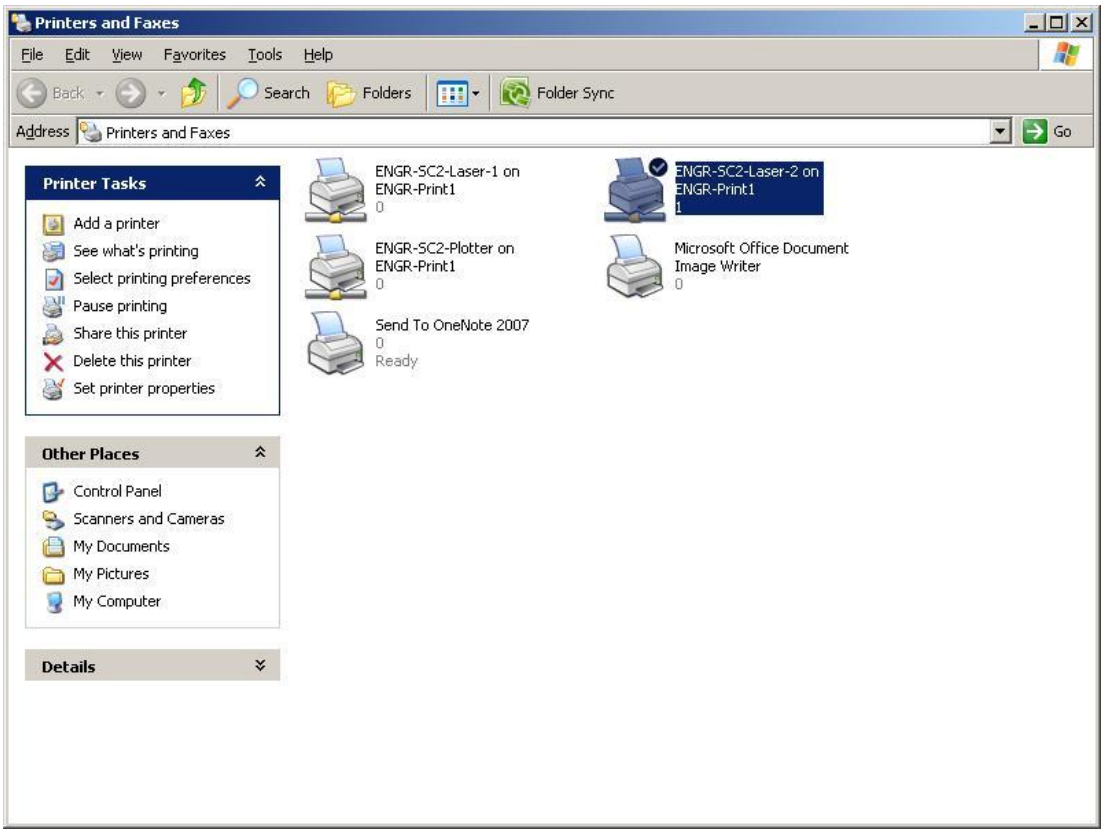
G.1. In the MicroStation dialog box, choose **File -> Compress -> Design**.

G.2. In the MicroStation dialog box, choose **File -> Save Settings**.

H. Select the black and white laser printer as the default printer.

H.1. From the Windows Start Menu in the lower left corner of the screen, choose **Start -> Printers and Faxes.**

H.2. In the Printers and Faxes dialog box, Select **ENGR-SC2-Laser-2ENGR-SC2-Laser-2,** choose **File -> Set as Default Printer**, then **close** the dialog box by pressing the red "**X**" in the upper right corner of the dialog box.

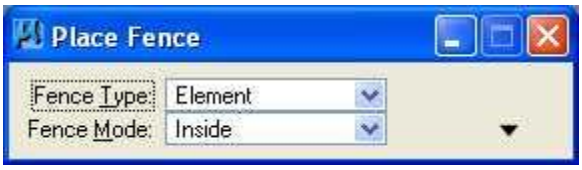


I. Place a fence around the rectangle and print the drawing.

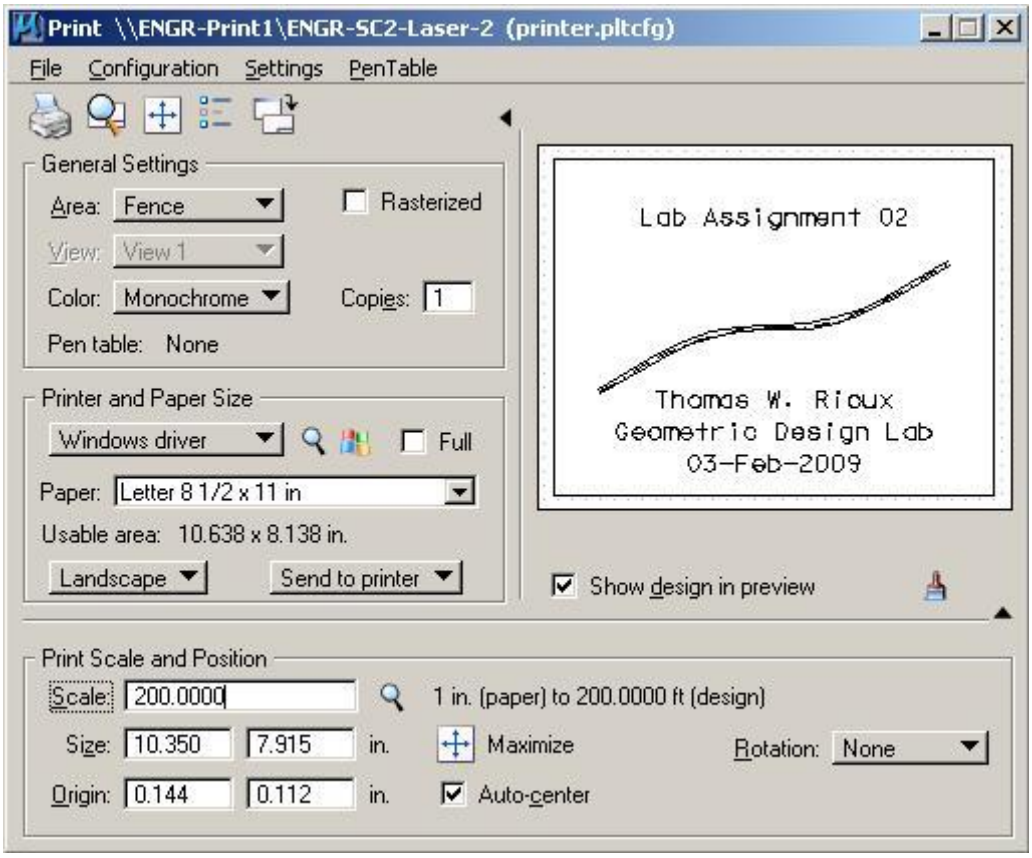
I.1. From the MicroStation tool palette, choose the **Fence** palette (top row right icon) and open it as a tool box in the MicroStation View 1 window.

I.2. From the Fence palette, choose the **Place** icon (leftmost icon)  . From the Place Fence dialog box, choose **Fence Type = Element** and **Fence Mode = Inside**; then select the **rectangle** enclosing the

entire design placed in Step E, and press the **Data** button (left button); and finally **close** the Fence palette by selecting the "X" in the upper right corner.

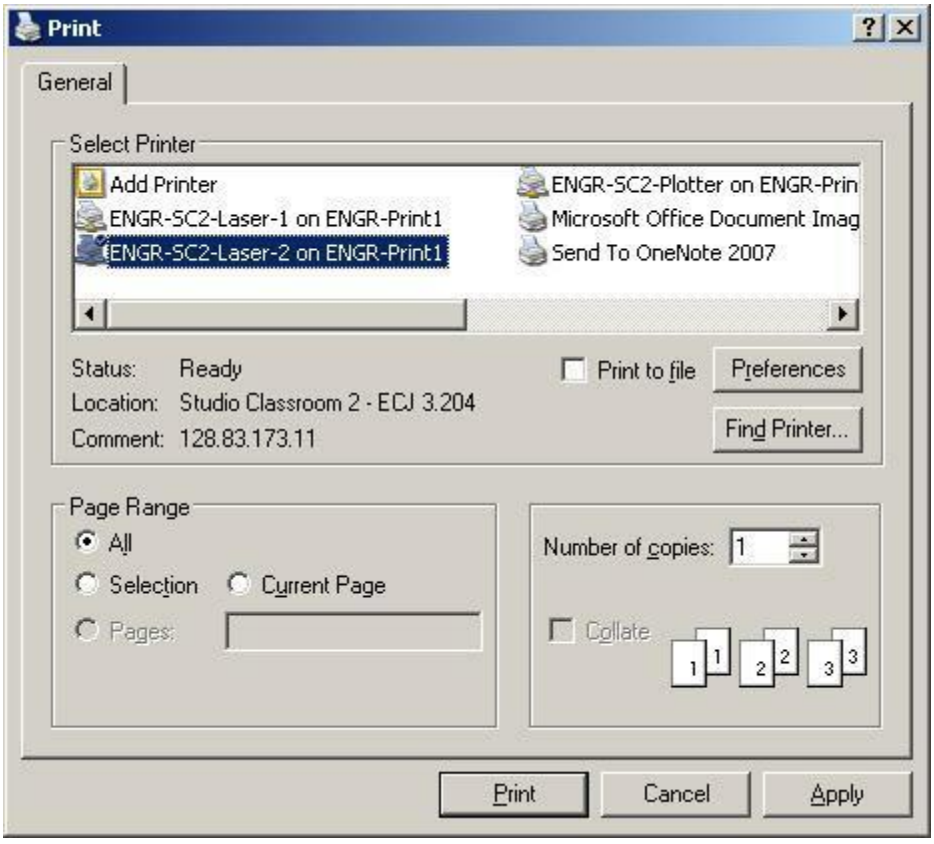


I.3. From the MicroStation window, choose **File -> Print**. If the Print dialog box does not look like the image below because it is narrower, press the right-arrow Show Preview button below the "X" in the upper right corner. If the Print dialog box does not look like the image below because it is shorter, press the down-arrow Show Details button in the lower right corner.

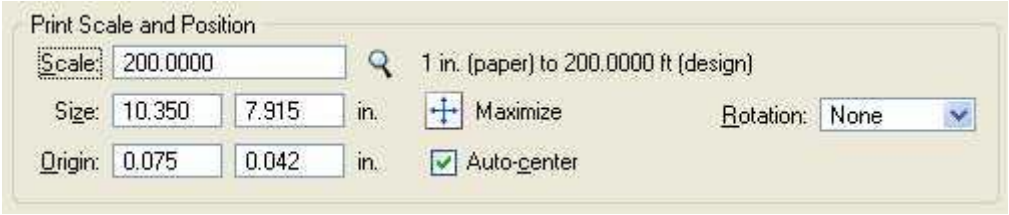


I.4. From the Print dialog box in the General Settings group, choose **Area = Fence**, **Copies = 1**, and **Color = Monochrome**.

I.5. From the Print dialog box in the Printer and Paper Size group, press the **Configure Windows Printer** icon immediately to the right of the Select Printer Driver icon . In the Print dialog box, in the **Select Printer** group choose **ENGR-SC2-Laser-2ENGR-SC2-Laser-2**, press the **Apply** push button, and **close** the Print dialog box by selecting the "X" in the upper right corner.



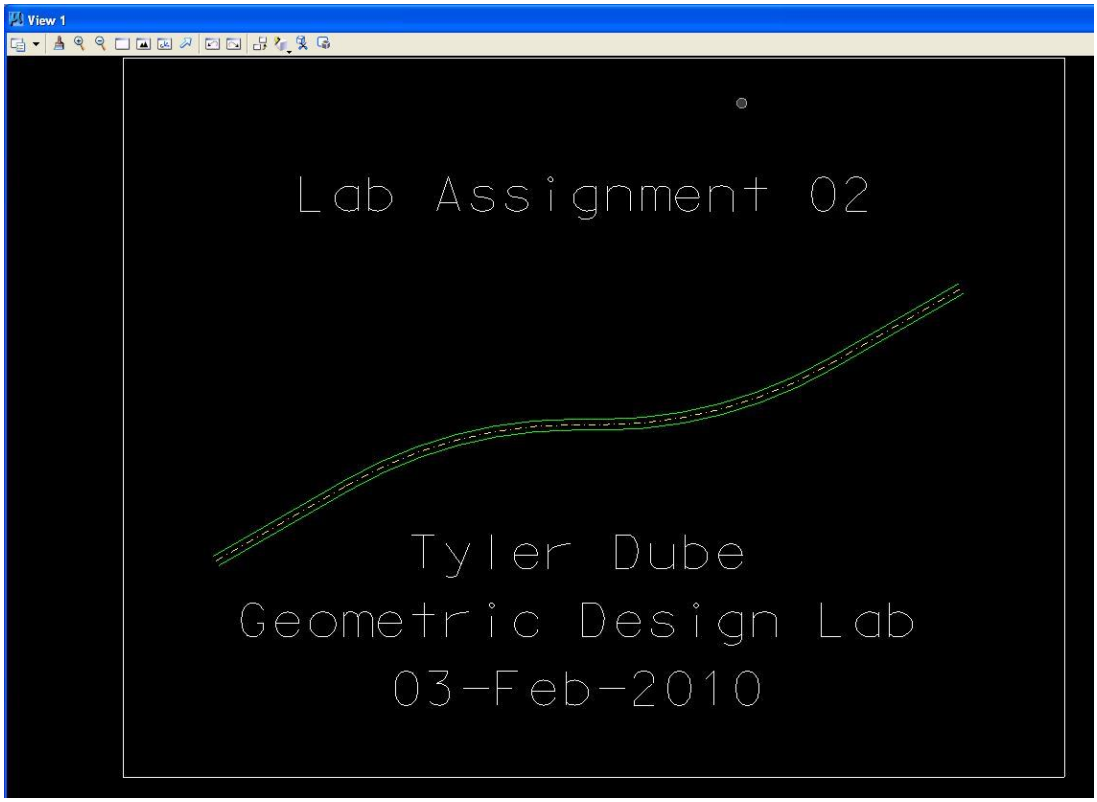
I.6. From the Print dialog box in the Printer and Paper Size group, choose **Paper = Letter**, **Landscape**, and **deselect Full Sheet**. From the Print dialog box in the Print Scale and Position group, set Scale To **200** ft (dgn) to 1 in. (paper).



I.7. From the Print dialog box, choose **Settings -> Print Attributes...**. In the Print Attributes dialog box, set **Print Border** to **on**, set **Fence Boundary** to **off**, and press the **OK** push button.

I.8. From the Print dialog box, choose **File -> Print** and in the Print dialog box choose **Print**.

I.9. **Get your print** from the printer and check your print. **Close** the Print dialog box by selecting the "X" in the upper right corner.



Leg Centerline and Lanes Print

J. Exit MicroStation.

J.1. In the MicroStation dialog box, choose **File -> Compress -> Design**.

J.2. In the MicroStation dialog box, choose **File -> Save Settings**.

J.3. In the MicroStation dialog box, choose **File -> Exit**.

K. Reboot the computer.

CE367G Geometric Design Lab web page

CE 367G Geometric Design Lab - Lab 03
Areas and Dimensioning using MicroStation

Objective: Learn the concepts of points, lines, direction, distance, traverse, bearing and distance, Northing and Easting, dimensioning, and area measurement.

Activity: Start MicroStation and create a 2D design file " Z:\ MicroStation\lab_03.dgn" using the seed file " Z:\ MicroStation\train2d.dgn"; In MicroStation Settings -> Design File -> Working Units, in the Modify Working Unit Settings area, in the Angles area, set Mode: to Bearing; Use MicroStation to draw the perimeter of Farmer John's land; Use MicroStation to draw the TxDOT right-of-way line on Farmer John's land; Use MicroStation to dimension each line with the bearing and distance; Use MicroStation to measure and label the area remaining in Farmer John's land and the area purchased by TxDOT; Place a landscape oriented rectangle centered around the land in 8.5" by 11" proportion (800 feet by 600 feet); Place the title "Lab Assignment 03" centered at the top and your name, class name, and assignment due date in the lower right; Place a fence from the rectangle and plot the drawing; Exit MicroStation; and Reboot the computerReboot the computer.

Background: A *point* is a location on or near the surface of the earth. Rectangular coordinates (also called plane or Cartesian coordinates) are used in Civil Engineering practice to define the location of points in local surveys. Coordinates are measured linearly along a pair of orthogonal axes that define a horizontal plane. The intersection of these axes is the origin (0,0) of the rectangular coordinate system. From the origin, the positive X (East) axis is to the right of the origin and the positive Y (North) axis is upward from the origin. The Z (elevation) coordinate is measured orthogonally to the X,Y horizontal plane.

A *line* is defined by a point and a direction. A line has infinite length and extends forward and back from the line point an infinite distance.

A *direction* is an angle measured from a reference meridian (usually grid North or grid South). *Azimuth from North* is the clockwise angle from the North meridian. *Azimuth from South* is the clockwise angle from the South meridian. Azimuth ranges from zero to 360 degrees. *Bearing* is the compass direction measured: clockwise from the North meridian in the Northeast (NE) quadrant, counterclockwise from the South meridian in the Southeast (SE) quadrant, clockwise from the South meridian in the Southwest (SW) quadrant, and counterclockwise from the North meridian in the Northwest (NW) quadrant. Bearing ranges from zero to 90 degrees. Examples of bearings: N 30 E, S 1.5 W, S 35.6 E, and N 45 W.

A *distance* is the length in linear units of a line segment (straight or curved) between two points.

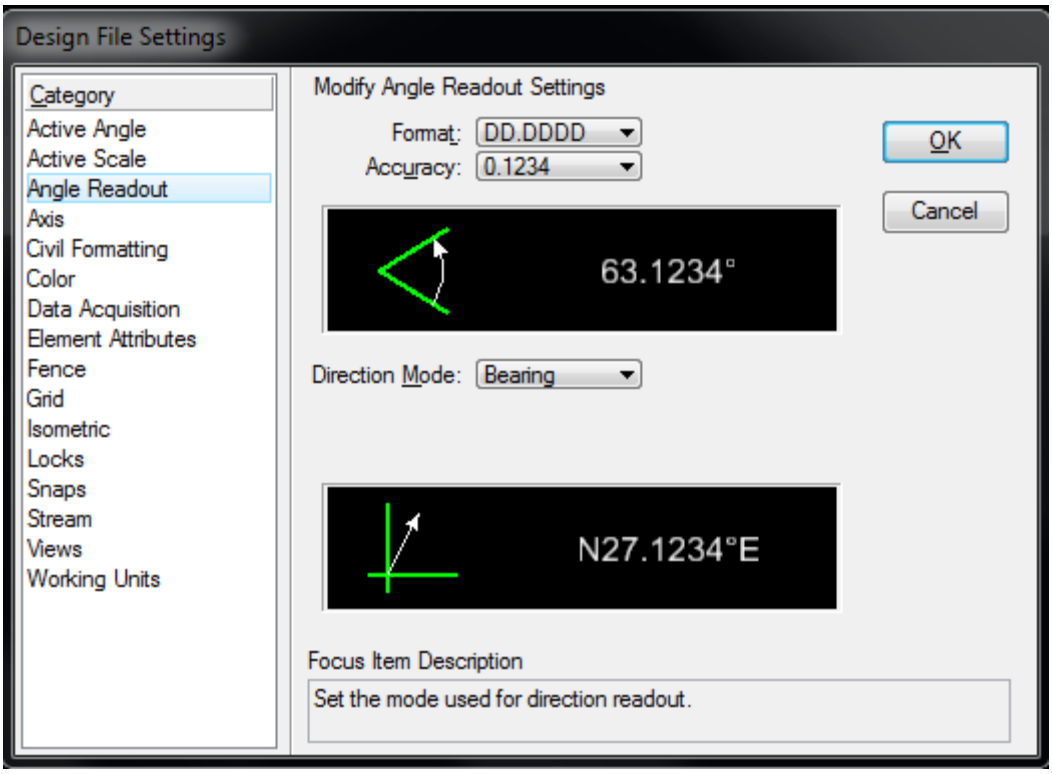
A *traverse* is a series of connected lines of known length related to one another by known angles.

Bearing and distance is normally used to describe relative location information; how to traverse from one point to another point. Bearing and distance is commonly used in surveying and legal descriptions of land to describe the perimeter of an area.

A *Northing* is the distance from the X Axis to a point while an *Easting* is the distance from the Y Axis to a point. A Northing and an Easting is normally used to describe the absolute coordinate of a point.

A. Start MicroStation and create a 2D design file " Z:\ MicroStation\lab_03.dgn" using the seed file " Z:\ MicroStation\train2d.dgn".

B. In MicroStation Settings -> Design File -> Angle Readout, in the Direction area, set Mode: to Bearing.



C. Use MicroStation to draw the perimeter of Farmer John's land. Farmer John's land starts at a point North 150 feet and East 300 feet, thence 305 feet North 1.5 degrees East, thence 400 feet North 89 degrees East, thence 300 feet South 2.4 degrees East, and finally back to the starting point. Farmer John's land is 124,035.7304 square feet.

C.1. **Set the active level to Default (level=Default), color to green (color=2), style to solid (style=0), and weight to 0 (weight=0).**

C.2. **Draw a line starting at North 150 feet and East 300 feet and traversing 305 feet North 1.5 degrees East.**

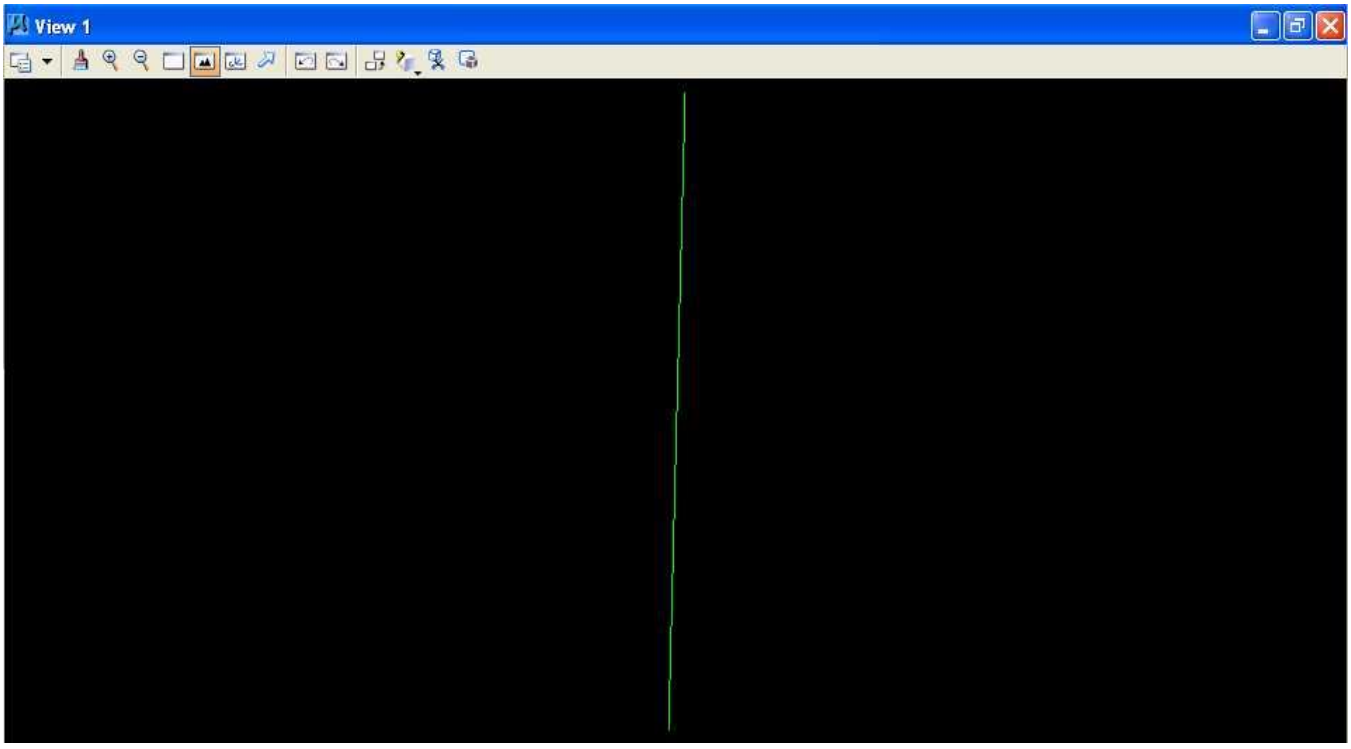
C.2.a. From the MicroStation Main Tool menu, select the **Linear Elements** palette (row 2 right icon) and open it as a tool box in the MicroStation View 1 window.

C.2.b. From the Linear Elements palette, choose the **Place Line** icon (2nd from left on the top row).

C.2.c. In the MicroStation **Key-in** field, enter "**xy=300,150**" plus a carriage return or the **Enter** key. For more information on MicroStation key-ins, in the MicroStation dialog box, choose **Help -> Contents**, then choose the **Search** tab, then enter **precision**, then press the **List Topics** push button, then double-click on **Precision Input Key-ins**, read the help information, and finally **close** the help dialog box.

C.2.d. In the MicroStation **Key-in** field, enter "**di=305,N 1.5 E**" plus a carriage return or the **Enter** key (be sure that you type a blank between the "N" and the "1.5" and between the "1.5" and the "E").

C.2.e. In Window 1, press the **Fit View** icon (the 5th icon from the left); the line should be visible.

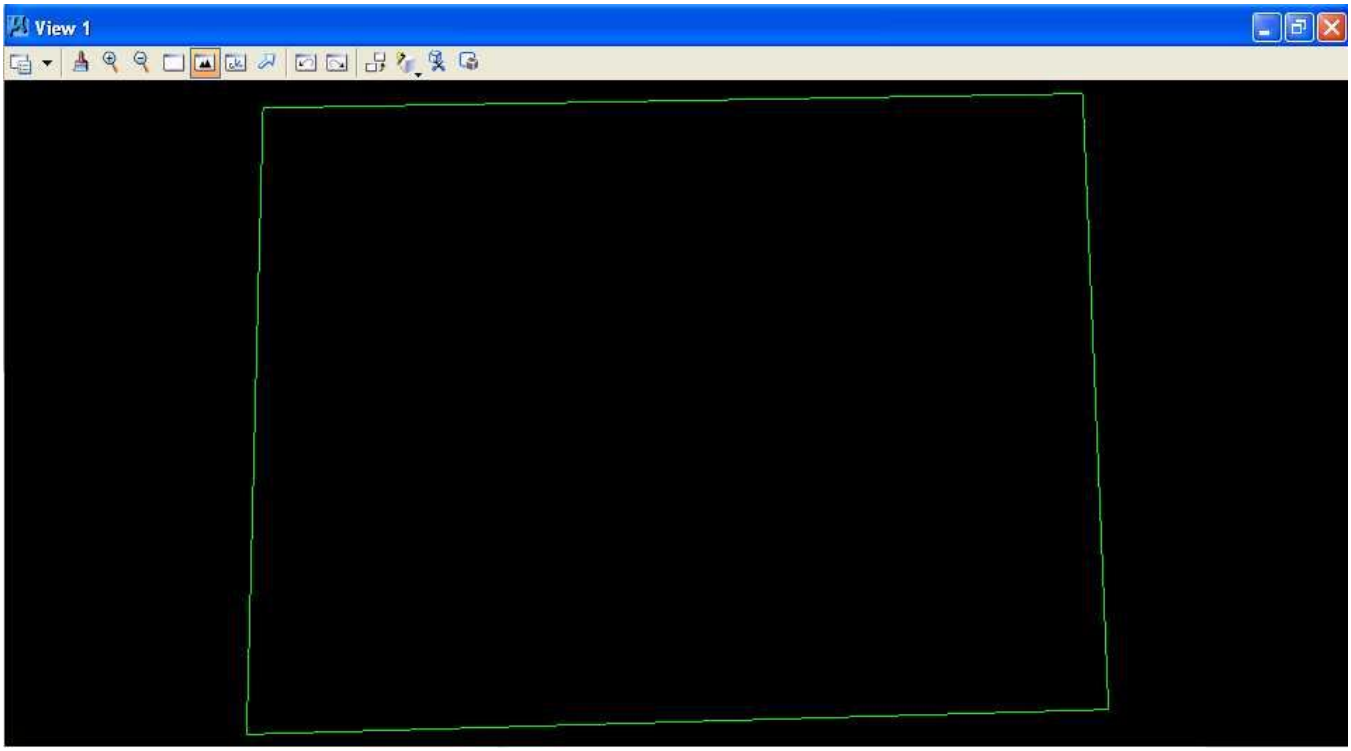


C.2.g. Finally, press the **Reset** button.

C.3. **Draw a line traversing 400 feet North 89 degrees East from the end of the previous line and fit View 1.**

C.4. **Draw a line traversing 300 feet South 2.4 degrees East from the end of the previous line and fit View 1.**

C.5. **Draw a line traversing from the end of the previous line to the beginning point and fit View 1.**



D. Use MicroStation to draw the TxDOT right-of-way line on Farmer John's land. The Texas Department of Transportation (TxDOT) wants to build a roadway where the edge of the right of way would be a due East/West line at a Northing of 235 feet and the roadway would take the southern part of Farmer John's land.

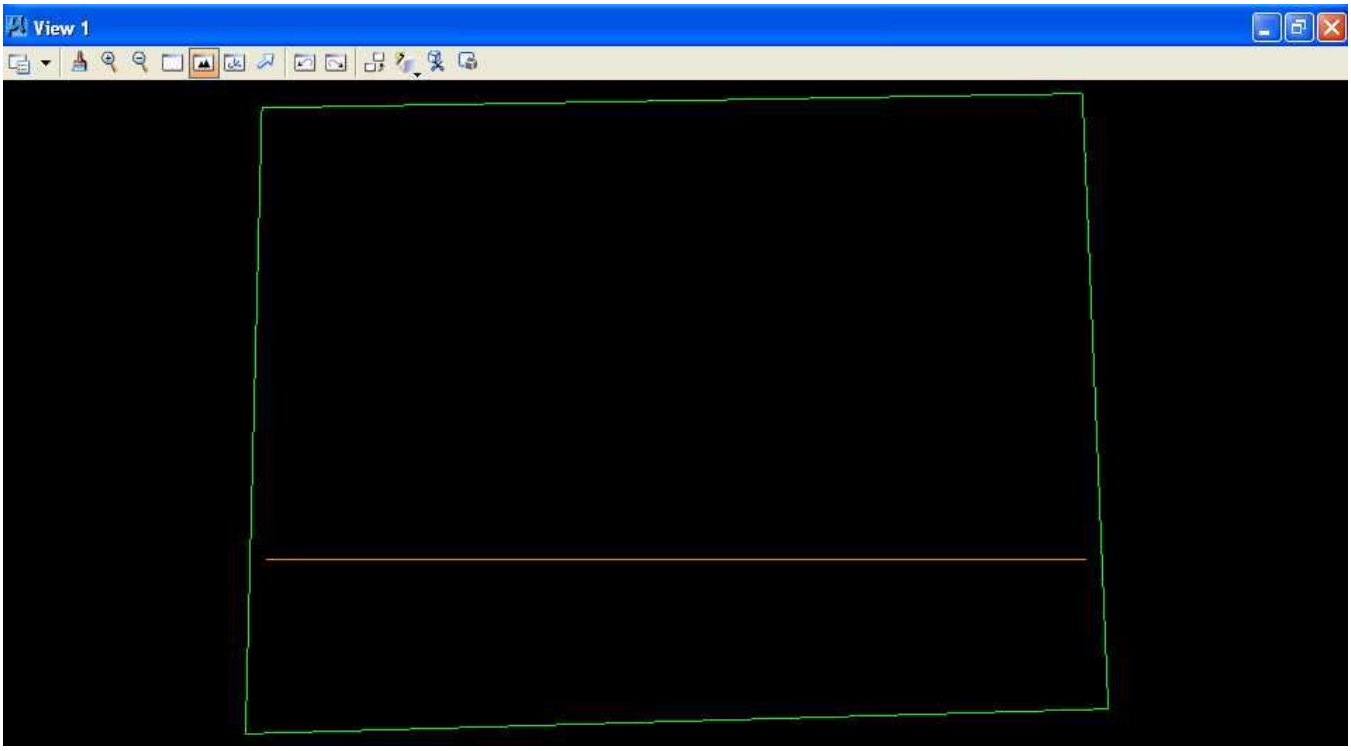
D.1. **Set the color to orange (color=6).**

D.2. **Draw a horizontal line at a Northing of 235 feet.**

D.2.a. From the Linear Elements palette, choose the **Place Line** icon (2nd from left on the top row).

D.2.b. In the **Place Line** dialog box, select **Length** to be active and enter a value of **400** feet and select **Angle** to be active and enter a value of **0**.

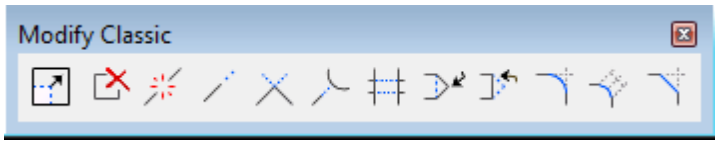
D.2.c. In the MicroStation **Key-in** field, enter "**xy=310,235**" plus a carriage return or the **Enter** key



D.3. **Extend the horizontal line to intersect with Farmer John's land perimeter.**

D.3.a**. Partial Delete the line placed in Step C.2 (the first green line placed) near the intersection with the line placed in Step D.2 (the orange line) to create 2 lines and Partial Delete the line placed in Step C.4 (the third green line placed) near the intersection with the line placed in Step D.2 (the orange line) to create 2 lines.**

D.3.a.1. From the MicroStation tool palette, select the **Modify** palette (bottom row right icon) and open it as a tool box in the MicroStation View 1 window.

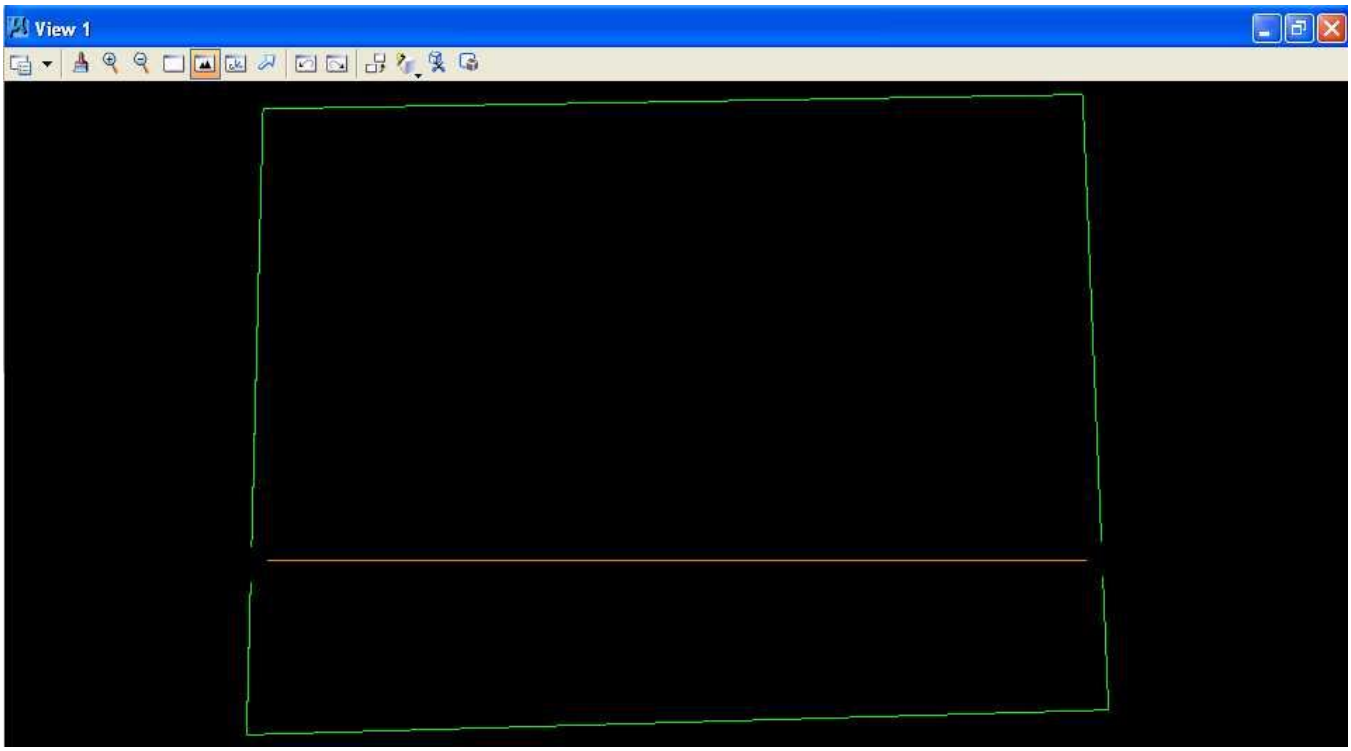


D.3.a.2. From the Modify palette, press the **Partial Delete** icon (2nd icon from the left)  .

D.3.a.3. Move the cursor over the **line placed in Step C.2** (the first green line placed) **just below the line placed in Step D.2** (the orange line) and press the **Data** button and move the cursor over the **line placed in Step C.2** (the first green line placed) **just above the line placed in Step D.2** (the orange line) and press the **Data** button (placing the first point below then placing the second point above keeps the original direction of the line in the 2 resultant lines).

D.3.a.4. Move the cursor over the **line placed in Step C.4** (the third green line placed) **just above the line placed in Step D.2** (the orange line) and press the **Data** button and move the cursor over the **line placed in Step C.4** (the third green line placed) **just below the line placed in Step D.2** (the orange

line) and press the **Data** button (placing the first point above then placing the second point below keeps the original direction of the line in the 2 resultant lines).



D.3.b. **Extend Elements to Intersection the 2 lines created in Step D.3.a.3 to the intersection with the line placed in Step D.2 (the orange line) and Extend Elements to Intersection the 2 lines created in Step D.3.a.4 to the intersection with the line placed in Step D.2 (the orange line).**

D.3.b.1. From the Modify palette, choose the **Trim to Intersection** icon (5th icon from the left)  .

D.3.b.2. Move the cursor over the **orange line** and press the **Data** button. The orange line should be highlighted.

D.3.b.3. Move the cursor over the **bottom of the 2 lines created in Step D.3.a.3** and press the **Data** button. Both lines should be extended to their intersection and both lines should be back to their original color.

D.3.b.4. Move the cursor over the **orange line** again and press the **Data** button. The orange line should be highlighted.

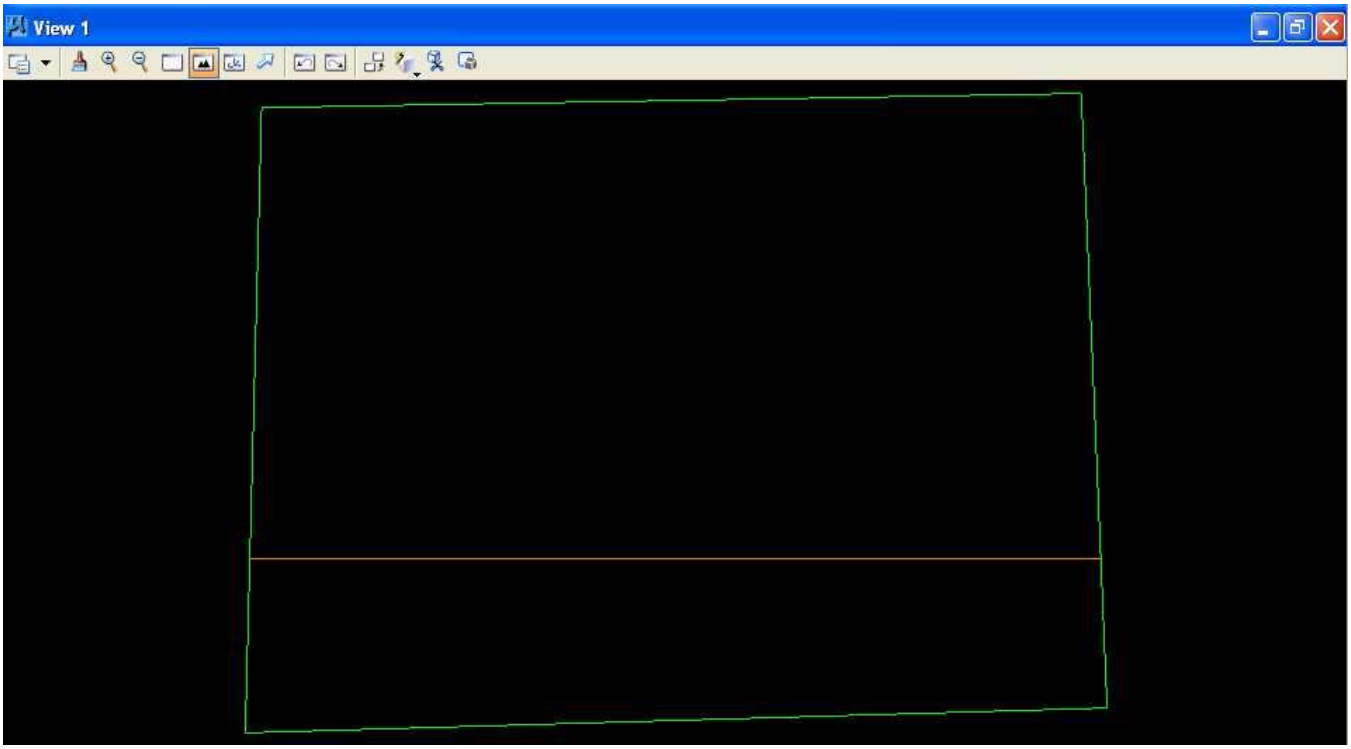
D.3.b.5. Move the cursor over the **top of the 2 lines created in Step D.3.a.3** and press the **Data** button. Both lines should be extended to their intersection and both lines should be back to their original color.

D.3.b.6. Move the cursor over the **orange line** and press the **Data** button. The orange line should be highlighted.

D.3.b.7. Move the cursor over the **bottom of the 2 lines created in Step D.3.a.4** and press the **Data** button. Both lines should be extended to their intersection and both lines should be back to their original color.

D.3.b.8. Move the cursor over the **orange line** again and press the **Data** button. The orange line should be highlighted.

D.3.b.9. Move the cursor over the **top of the 2 lines created in Step D.3.a.4** and press the **Data** button. Both lines should be extended to their intersection and both lines should be back to their original color.



E. Use MicroStation to dimension each line with the bearing and distance.

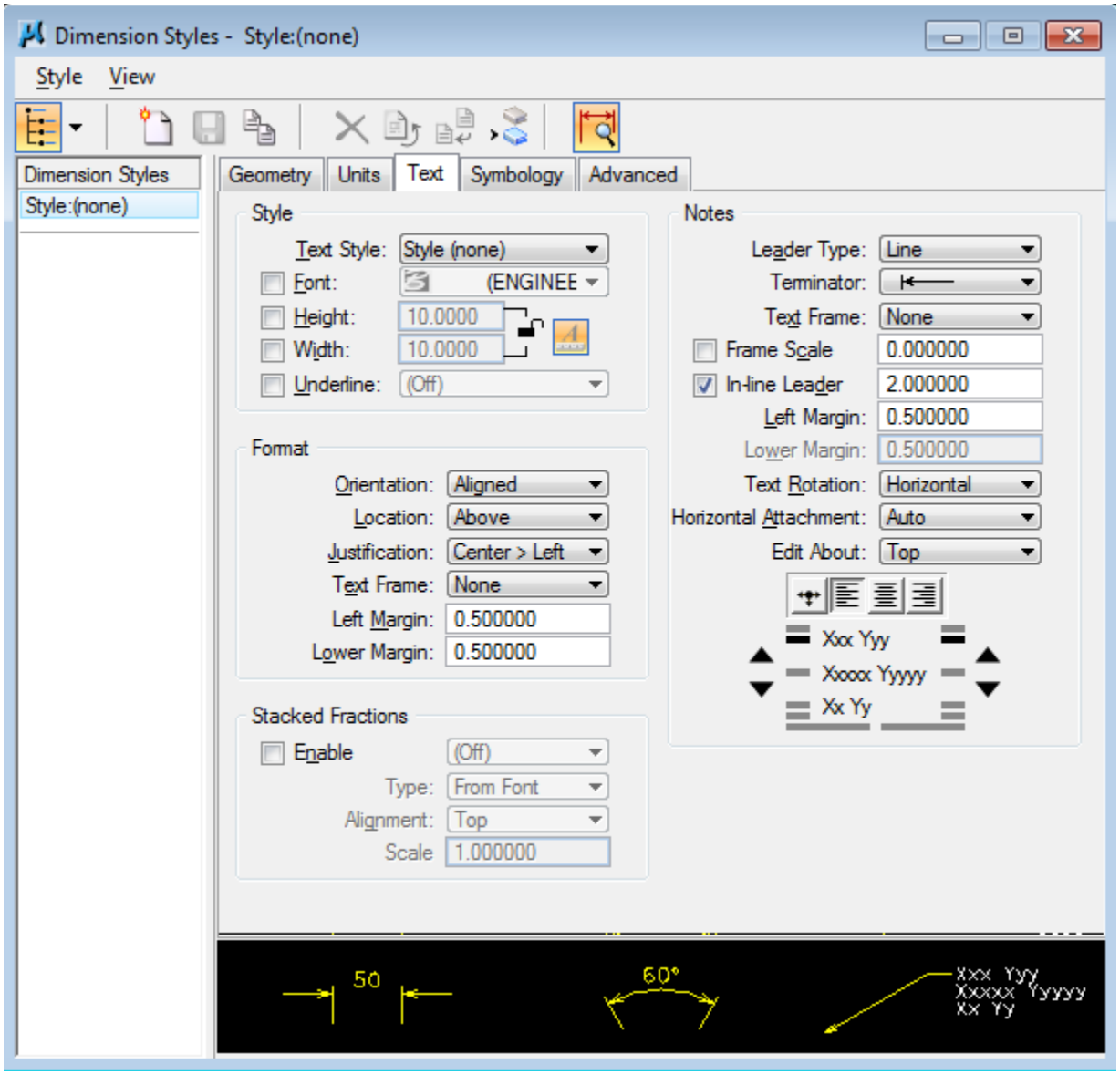
E.1. **Set the color to yellow (color=4).**

E.2. **Set the text height to 10 feet, the width to 10 feet, the line spacing to 10 feet, and the font of 3 (font=ENGINEERING).**

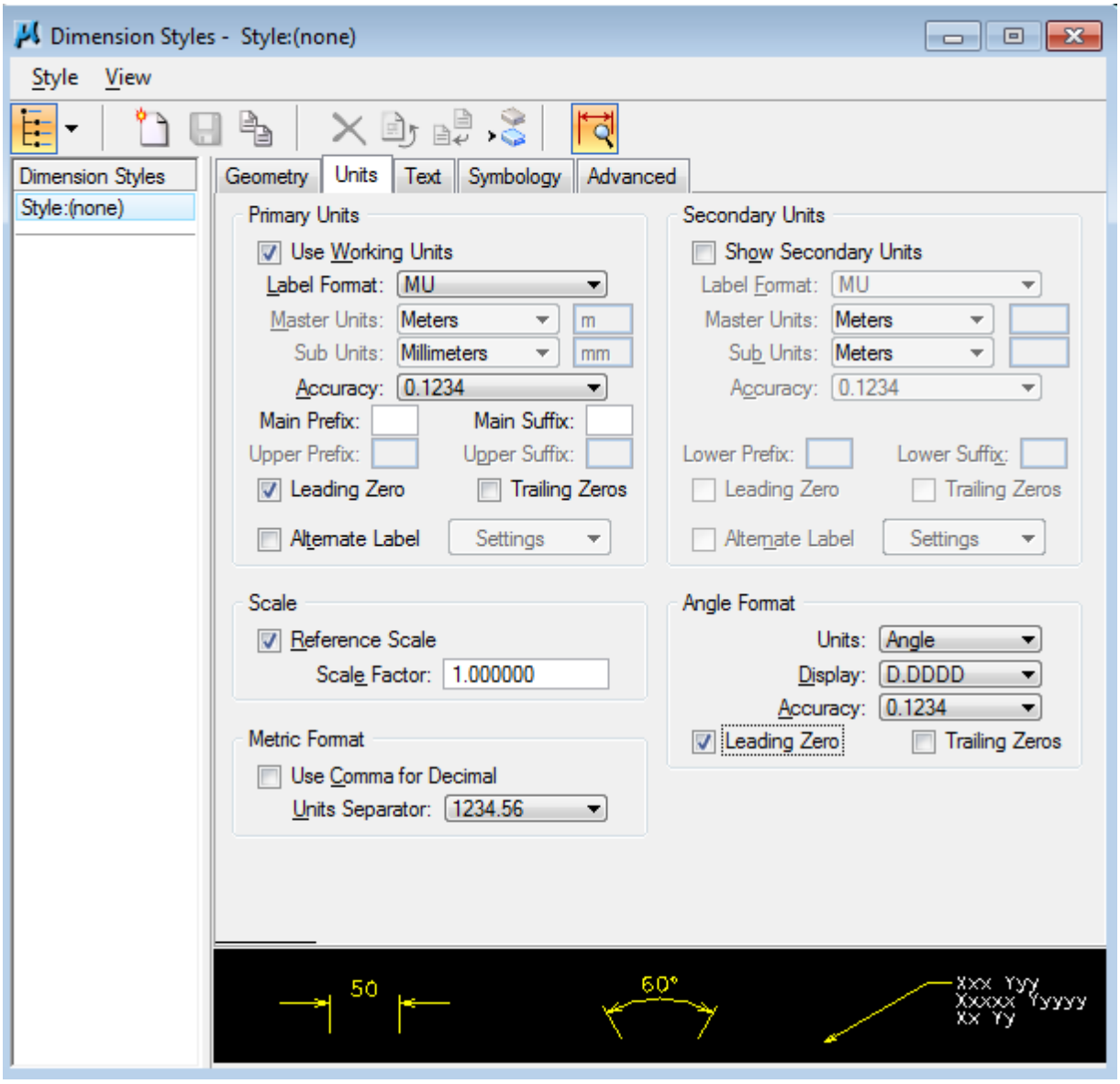
E.3. **Set the dimension styles.**

E.3.a. Choose **Element -> Dimension Styles**.

E.3.b. In the Dimension Styles dialog box, choose **Text**; in the Style group, set **Text Style** to **Style (none)** and **deselect Font, Height, Width, and Underline**; in the Format group, set **Orientation** to **Aligned**, **Location** to **Above**, **Justification** to **Center > Left**, **Text Frame** to **None**, **Left Margin** to **0.5**, **Lower Margin** to **0.5**; and in the **Stacked Fractions** group, **deselect Enable**.

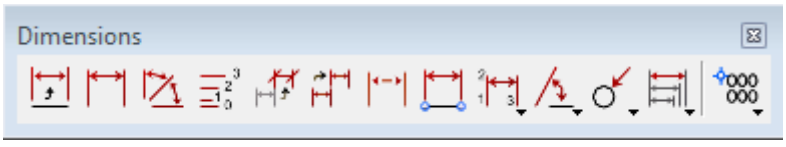


E.3.c. In the Dimension Styles dialog box, choose **Units**; under the **Primary Units** group, **select Use Working Units**, set **Label Format** to **MU**, set **Accuracy** to **0.1234**, **select Leading Zero**, and **deselect Trailing Zeros** and **Alternate Label**; under the **Secondary Units** group, **deselect Show Secondary Units**; under the **Scale** group, **select Reference Scale** and set **Scale Factor** to **1.0**; in the **Metric Format** group, **deselect Use Comma for Decimal**; and in the **Angle Format** group, set **Units** to **Angle**, set **Display** to **D.DDDD,** set **Accuracy** to **4 decimal places**, **select Leading Zero,** and **deselect Trailing Zeros**.



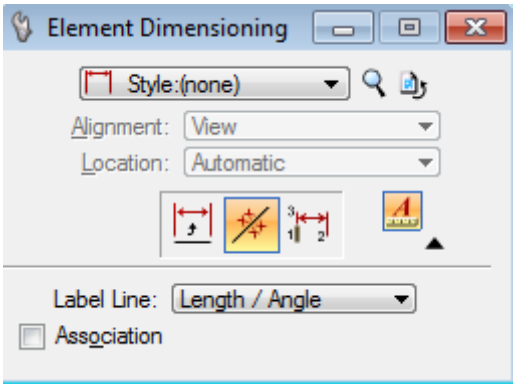
E.3.d. Close the Dimension Settings dialog box.

E.4. From the MicroStation tool palette, select the **Dimensions** palette (row 7 right icon) and open it as a tool box in the MicroStation View 1 window.



E.4.a. From the Dimensioning palette, choose the **Dimension Element** icon (leftmost icon)  .

E.4.b. From the Element Dimensioning dialog box, press the **Label Line** push button  and set **Label Line** to **Length / Angle**.



E.4.c. In the MicroStation window, choose **Settings -> Snaps**. If **Keypoint** does not have a mark to its left then select Keypoint. In the Inform Message field,  should be displayed.

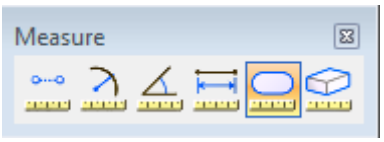
E.4.d. **Repeat** the following 2 instructions **for each line segment**:

E.4.d.1. Move the cursor to the **center** of the line and press the **Data** button.

E.4.d.2 Press the **Tentative** button to snap to the middle of the line and press the **Data** button to accept the snap.

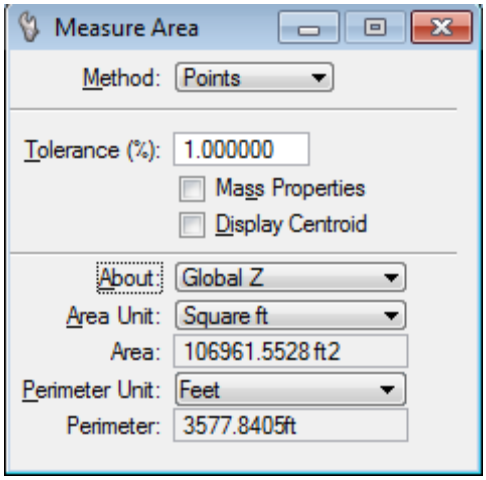
F. Use MicroStation to measure and label the area remaining in Farmer John's land and the area purchased by TxDOT.

F.1. From the MicroStation tool palette, select the **Measure** palette (row 7 left icon) and open it as a tool box in the MicroStation View 1 window.



F.2. From the Measure palette, choose the **Measure Area** icon (5th icon from the left)  .

F.3. From the Measure Area dialog box, set **Method** to **Points**, set **Tolerance** to **1%, deselect Mass Properties** and **Display Centroid**, set **About** to **Global Z** and set **Area Unit** to **square ft**.



F.4. **Measure the area remaining in Farmer John's land.**

F.4.a. Move the cursor to the **top left corner** of Farmer John's land, press the **Tentative** button, and press the **Data** button **anywhere** to accept the tentative snap.

F.4.b. Move the cursor to the **top right corner** of Farmer John's land, press the **Tentative** button, and press the **Data** button **anywhere** to accept the tentative snap.

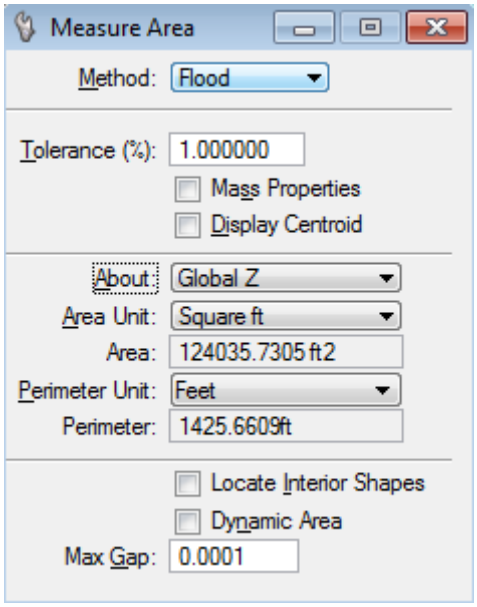
F.4.c. Move the cursor to the **bottom right corner** of Farmer John's land, press the **Tentative** button, and press the **Data** button **anywhere** to accept the tentative snap.

F.4.d. Move the cursor to the **bottom left corner** of Farmer John's land, press the **Tentative** button, and press the **Data** button **anywhere** to accept the tentative snap.

F.4.e. Press the **Reset** button and write down the value for **area** from the Inform Message field of the MicroStation Command Window using 4 decimal places.

F.5. **Measure the area of TxDOT's land.**

F.5.a. From the Measure Area dialog box, set **Method** to **Flood**, set **Tolerance** to **1%, deselect Mass Properties** and **Display Centroid**, set **About** to **Global Z**, set **Area Unit** to **square ft, deselect Locate Interior Shapes** and **Dynamic Area**, and **set Max Gap** to **0.0001**.



F.5.b. Move the cursor to the **center** of TxDOT's land, press the **Data** button, and press the **Data** button **anywhere** to accept the highlighted area.

F.5.c. Write down the value for **area** from the Inform Message field of the MicroStation Command Window using 4 decimal places.

F.6. **Set the color to orange (color=6), style to solid (style=0), and weight to 0 (weight=0).**

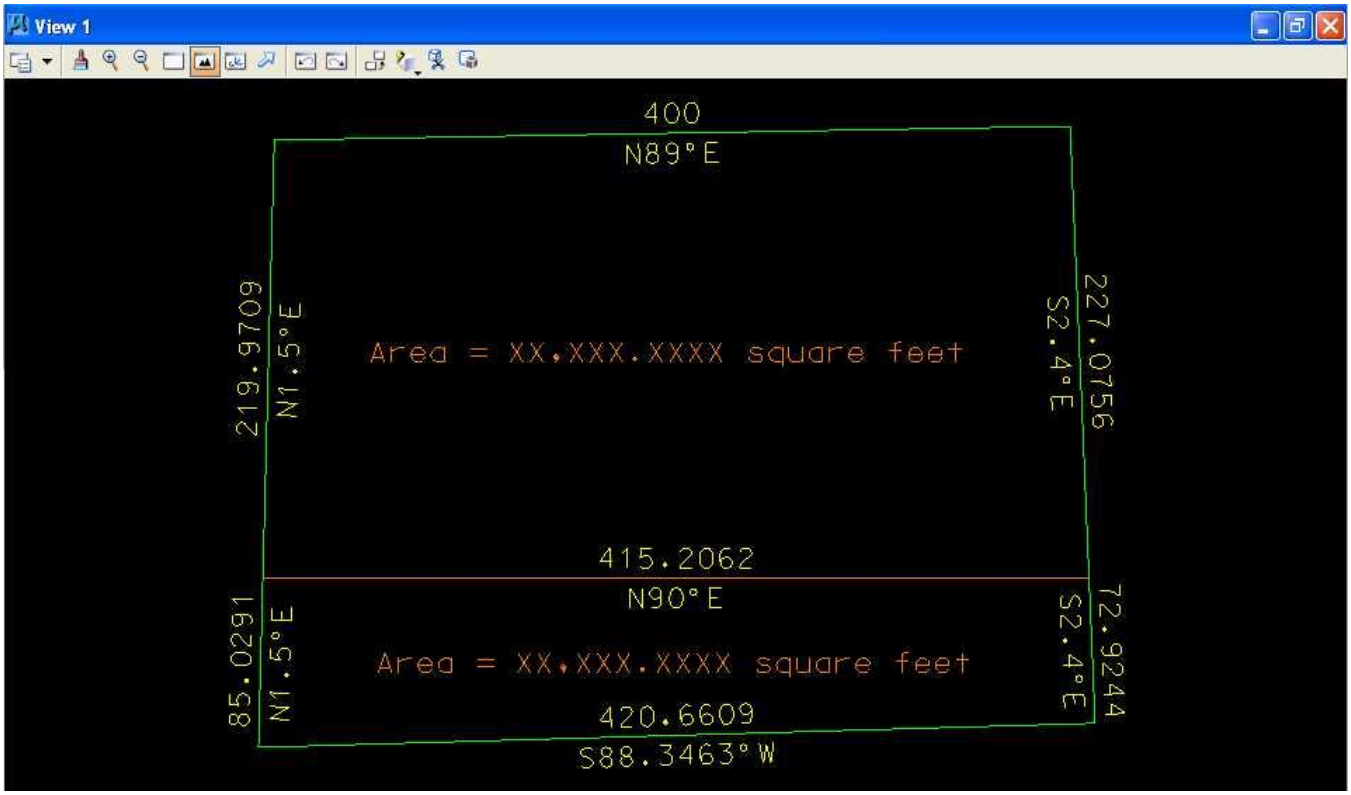
F.7. From the MicroStation tool palette, select the **Text** palette (row 5 right icon) and open it as a tool box in the MicroStation View 1 window.

F.8. From the Text palette, choose the **Place Text** icon (leftmost icon).

F.9. In the Place Text dialog box, set **Method** to **By Origin** and set **Active Angle** to **0.0**.

F.10. In the **Text Editor** dialog box, enter "**Area = XX,XXX.XXXX square feet**" where "XX,XXX.XXXX" is the value you calculated for Farmer John's land in Step F.4.e, move the cursor to the **center** of Farmer John's land, and press the **Data** button.

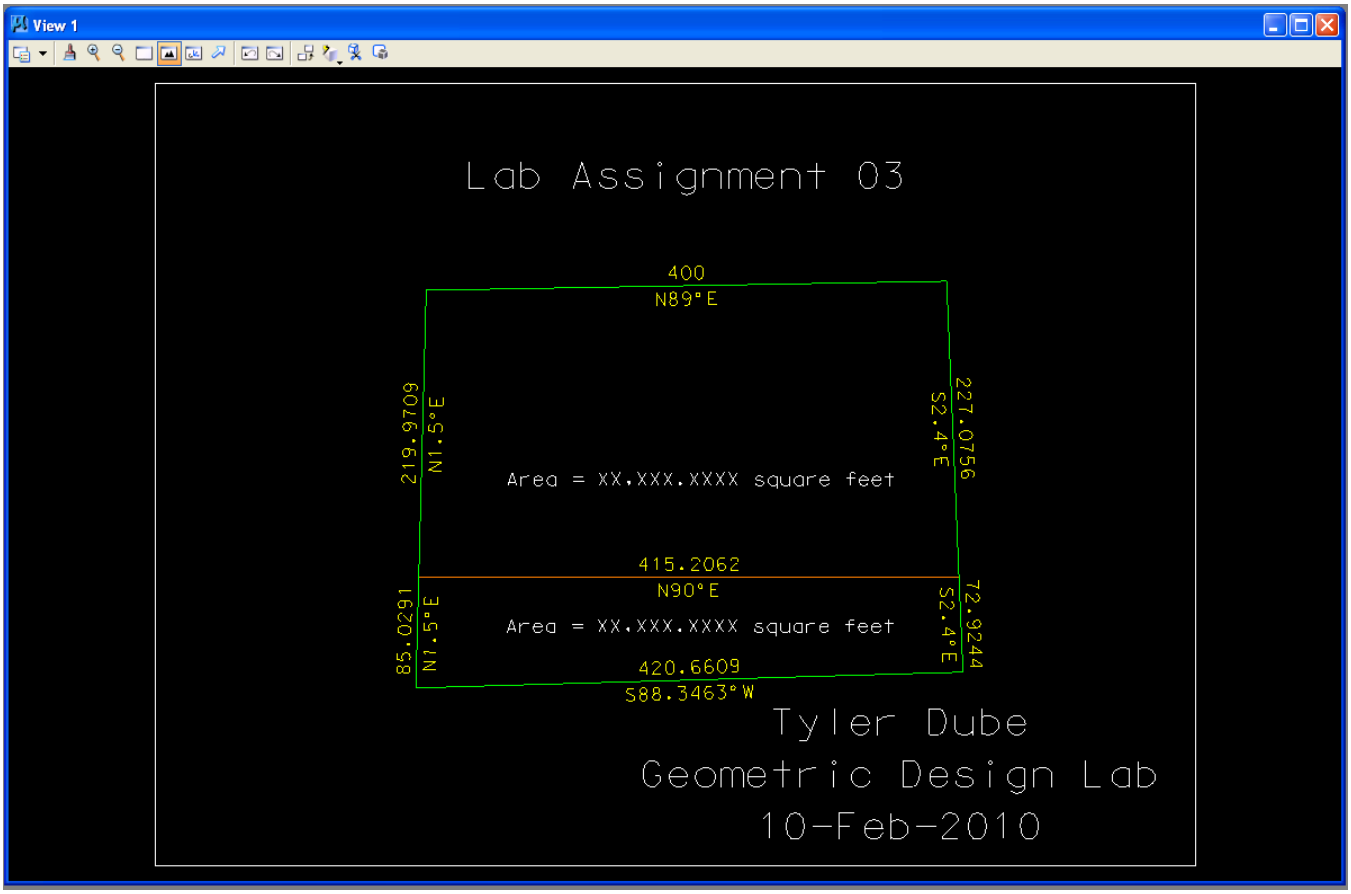
F.11. In the **Text Editor** dialog box, enter "**Area = XX,XXX.XXXX square feet**" where "XX,XXX.XXXX" is the value you calculated for TxDOT's land in Step F.5.c, move the cursor to the **center** of TxDOT's land, and press the **Data** button.



G. Place a landscape oriented rectangle centered around the land in 8.5" by 11" proportion (800 feet by 600 feet) with level of Default (level=Default), color of white (color=0), style of solid (style=0), and weight of 0 (weight=0).

H. Place the title "Lab Assignment 03" centered at the top and your name, class name, and assignment due date in the lower right at a text height, text width, and text line spacing of 20 feet with font of 3 (font=ENGINEERING), justification of Center Center, level of Default (level=Default), color of white (color=0), style of solid (style=0), and weight of 0 (weight=0).

I. Place a fence from the rectangle placed in Step G and plot the drawing using ENGR-SC2-Laser-2ENGR-SC2-Laser-2 and options for Fence, Monochrome, Letter, Landscape, a Scale of 80 ft / in, and Settings -> Print Attributes -> Fence boundary off and Print border on.



Farmer John's Land and TxDOT's Land Plot

J. Exit MicroStation.

K. Reboot the computer

CE 367G Geometric Design Lab web page

CE 367G Geometric Design Lab - Lab 04
Pavement Edge Design with a Simple Arc of a Circle and with a Taper Section and an Arc of a Circle using MicroStation

Objective: Learn pavement edge design and vehicle offtracking concepts using IGIDS-created vehicle turn template. Observe the reduction in circular arc radius and area when a taper section is added.

Activity: Copy the MicroStation Cell Library file "bus_template.cel" to " Z:\ MicroStation"; Start MicroStation and create a 2D design file " Z:\ MicroStation\lab_04.dgn" using the seed file " Z:\ MicroStation\train2d.dgn"; Use MicroStation to draw the legs of the intersection; Attach the cell file "bus_template.cel"; Place the IGIDS BUS Template cell; Construct a circular arc curb return; Use MicroStation to draw the 1:10 taper section line; Use MicroStation to construct a circular arc pavement edge; Use MicroStation to extend the taper section line to the green circular arc; Use MicroStation to measure, crosshatch, and dimension the area between the two pavement edges; Use MicroStation to dimension the two circular arcs and the taper section; Turn Default display on; Place a landscape oriented rectangle centered around the intersection in 8.5" by 11" proportion (230 feet by 180 feet); Place the title "Lab Assignment 04" at the top right and your name, class name, and assignment due date in the lower right; Place a fence from the rectangle and plot the drawing; Exit MicroStation; and Reboot the computerReboot the computer.

Background: The California Department of Transportation (CALTRANS) developed the *Truck Offtracking Model (TOM)*, a computer model of vehicle offtracking. The Texas State Department of Transportation (TxDOT) modified TOM and called it *TXTOM*. TXTOM was used to generate the vehicle turn templates found in the American Association of State Highway and Transportation Officials (AASHTO) design policy. The Center for Transportation Research at The University of Texas at Austin converted TXTOM from FORTRAN to C, added metric units, added metric parameters for the design vehicles, and incorporated TXTOM in the *Interactive Graphics Intersection Design System (IGIDS)*. For the standard AASHTO design vehicles, vehicle turning templates may be quickly drawn to a user-specified turn radius for the turn angle between adjacent, user-selected legs. The position of the outer edge of the front bumper and the inner edge of the rear axle are calculated as the outer edge of the front axle is moved in 1-foot (0.3048-foot) increments along a circular arc. An optional clearance zone in yellow may be specified that is calculated the specified distance outside the outer edge of the front bumper and inside the inner edge of the rear axle. These templates are created as a *MicroStation Cell*. A MicroStation Cell is a group of elements with an optional placement origin which can be manipulated as a single element. A MicroStation Cell is contained in a *MicroStation Cell Library* which can have one or more MicroStation Cells. These templates may be moved dynamically over the intersection geometry to evaluate pavement edge and channelization requirements.

A *taper section* is a line segment at a shallow angle to the pavement edge expressed as a ratio of lateral distance to longitudinal distance, usually in the range of 1:10 to 1:15. The taper section may precede and/or follow the circular arc. The use of taper sections can facilitate fitting the pavement edge to the offtracking path of a selected design vehicle and generally reduces the radius of the circular arc.

A. Copy the MicroStation Cell Library file "bus_template.cel" to " Z:\ MicroStation" .

A.1. Download the ‘bus_template.cel’ file to your Microstation folder. This file is located in Canvas

B. Start MicroStation and create a 2D design file " Z:\ MicroStation\lab_04.dgn" using the seed file " Z:\ MicroStation\train2d.dgn".

C. Use MicroStation to draw the legs of the intersection.

C.1. **Set the color to white (color=0), the style to solid (style=0), and the weight to 0 (weight=0).**

C.2. **From point 5000,5000, draw a 150 foot line at an angle of 270 degrees (Line A).**

C.3. **From point 5000,5000, draw a 200 foot line at an angle of 345 degrees (Line B).**

C.4. **Copy Line A a distance of 15 feet parallel to the right (Line C).**

C.5. **Copy Line B a distance of 15 feet parallel to the bottom (Line D).**

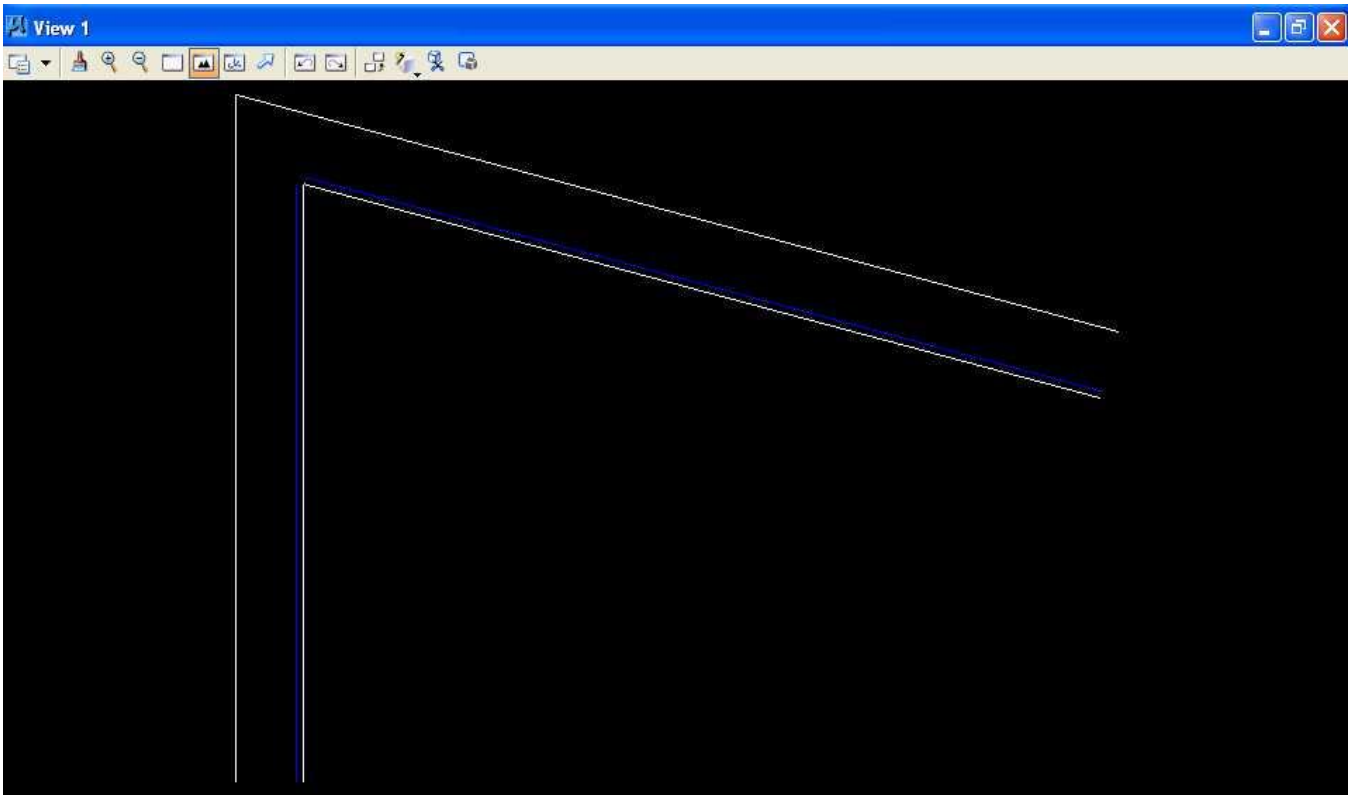
C.6. **Extend lines C and D to their intersection.**

C.7. **Copy Line C a distance of 1.5 feet parallel to the left (Line E).**

C.8. **Copy Line D a distance of 1.5 feet parallel to the top (Line F).**

C.9. **Change the color of Line E and Line F to blue (color=1).**

C.10. **Fit window 1.**



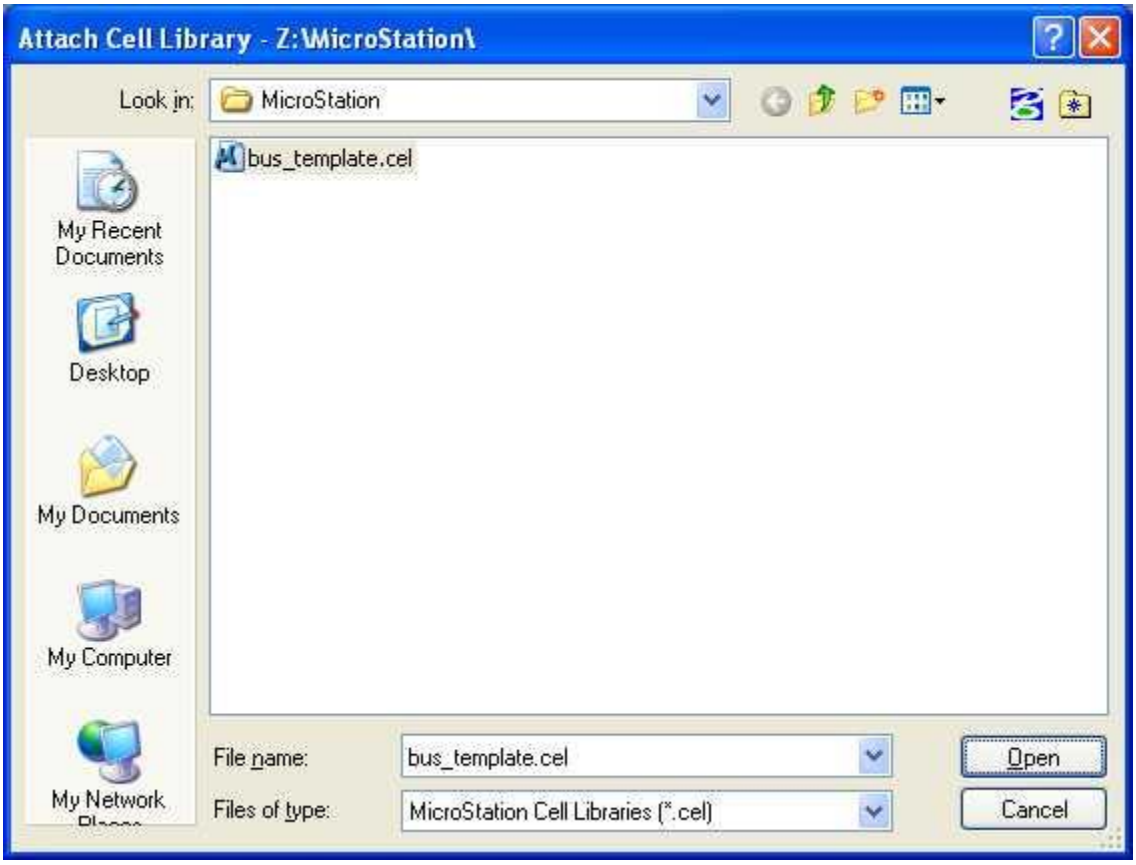
D. Attach the cell file "bus_template.cel".

D.1 Download the '**bus_template.cel**' file from Canvas or the project website to your Microstation folder.

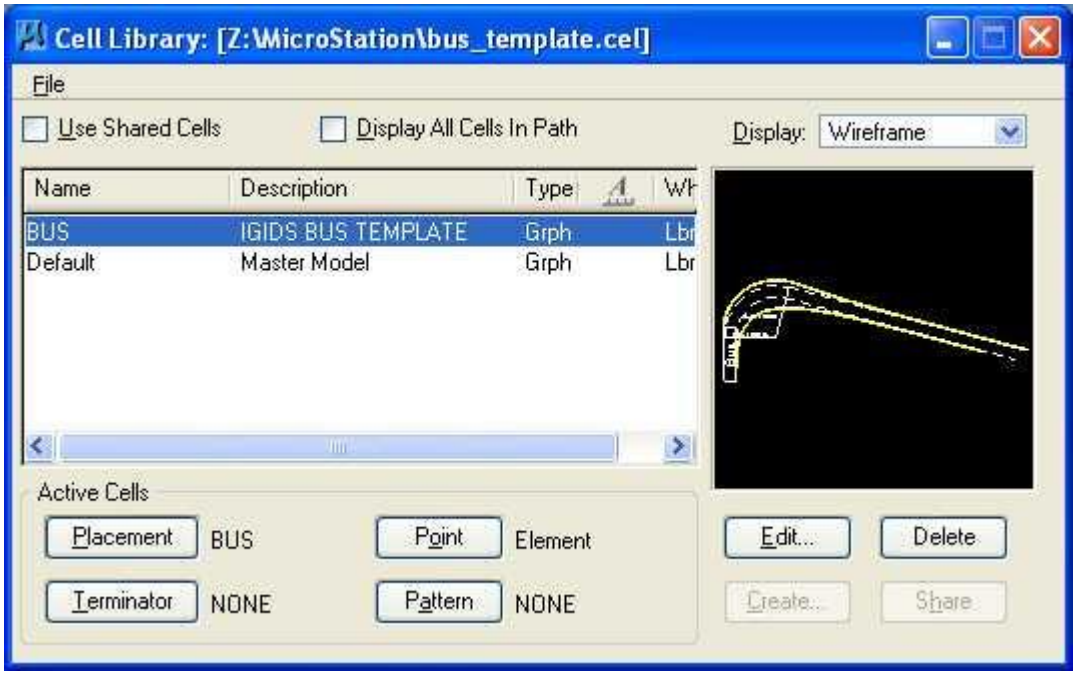
D.1. From the MicroStation dialog box, choose **Element -> Cells**.

D.2. In the Cell Library: [NONE] dialog box, choose **File -> Attach File**.

D.3. In the Attach Cell Library dialog box under **Look in:**, locate your Microstation folder; under **Files of type**, choose **MicroStation Cell Libraries (*.cel)**; choose **bus_template.cel**; and press the **Open** push button.



D.4. In the Cell Library: [Z:\ MicroStation\bus_template.cel] dialog box under Name, choose **BUS** and under Active Cells select **Placement**. IGIDS was used to generate this vehicle turn template for a Bus with a turn radius of 38 feet, with a 1 foot clearance zone (yellow lines), and with a turn angle of 105 degrees.



D.5. **Close** the Cell Library: [Z:\ MicroStation\bus_template.cel] dialog box by pressing  in the upper right corner.

D.6. From the MicroStation dialog box, choose **File -> Save Settings**.

E. Place the IGIDS BUS Template cell on Default (level=Default).

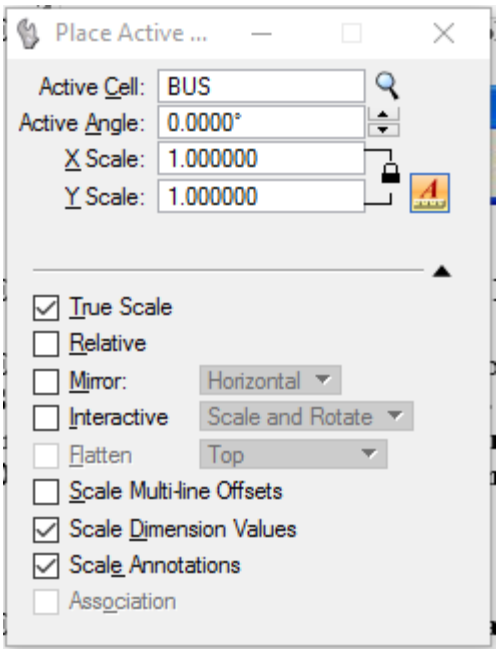
Note: It's important to set working units to feet and resolution to 1000000 per foot before placing the cell (see section C.10 in lab 01).

E.1. Set the active **level** to **Default** (level=Default).

E.2. From the MicroStation Main Tool menu, select the **Cells** palette (6th row right icon).

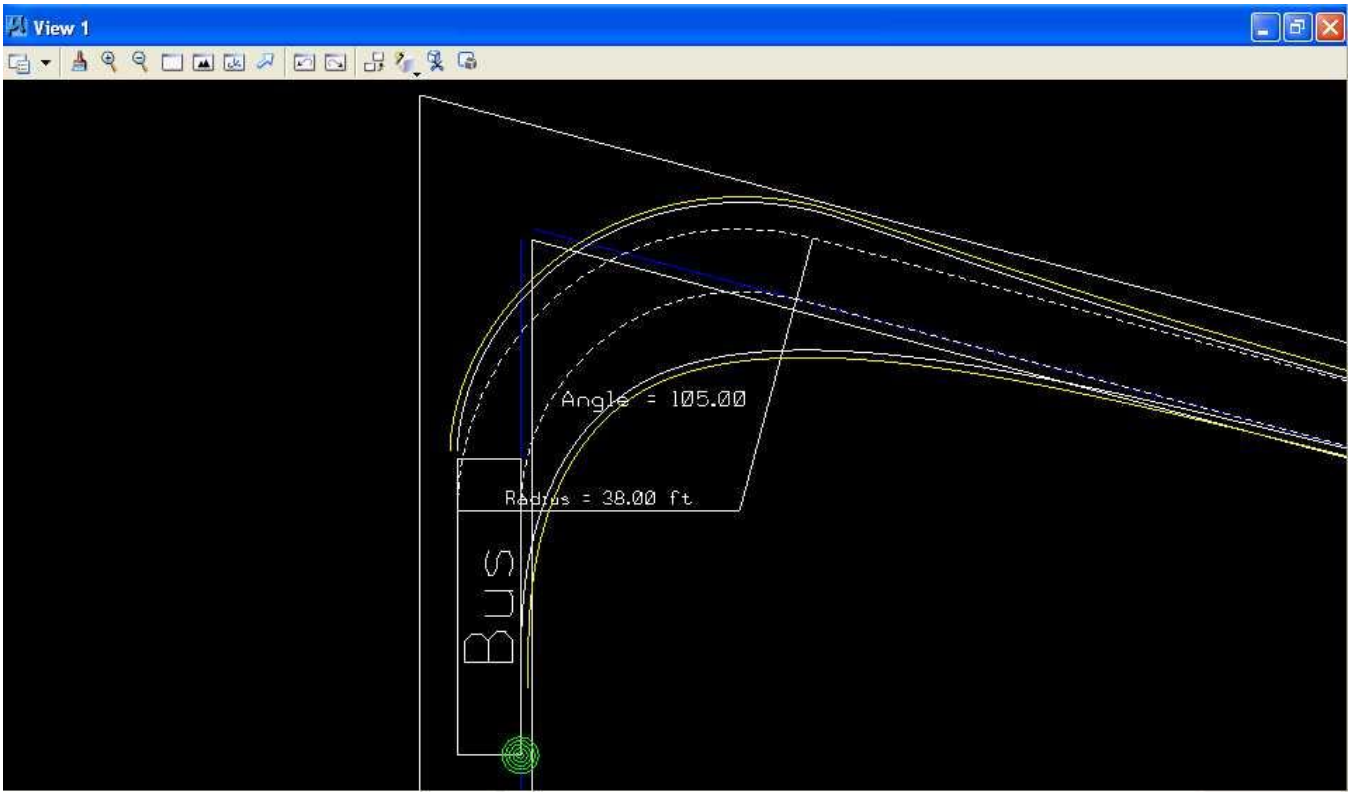
E.3. From the Cells palette, select the **Place Active Cell** icon (first icon from the left)  .

E.4. In the Place Active Cell dialog box, ensure that the **Active Cell** is **BUS**, the **Active Angle** is **0.0**, **X Scale** is **1.0**, **Y Scale** is **1.0**, the **scale** is **locked**, **True Scale** is **set, Relative** is **unset** (the BUS cell was created on Default), **Mirror** is **unset**, **Interactive** is **unset**, **Scale Multi-line Offsets** is **unset**, **Scale Dimension Values** is **set**, and **Scale Annotations** is **set**.

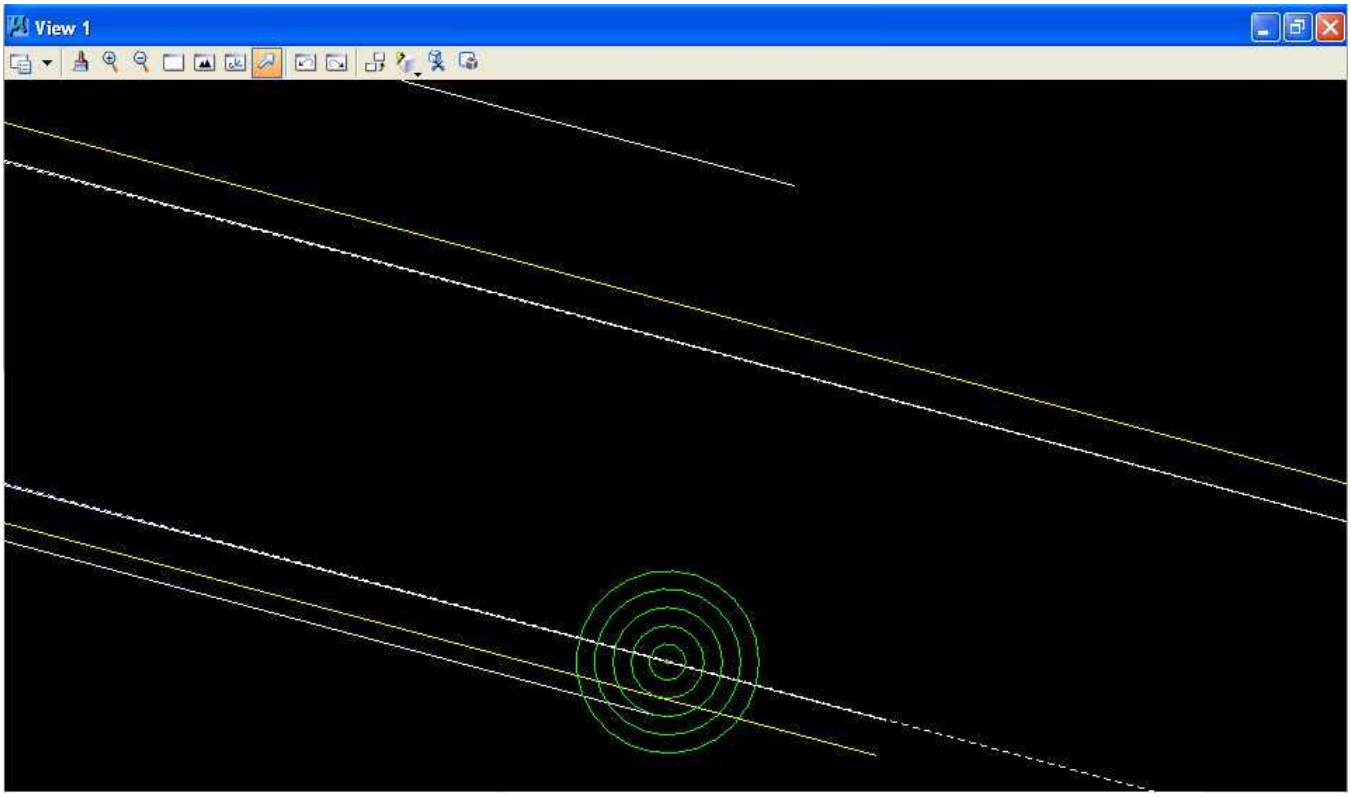


E.4 From the Modify palette, use **Scale** to resize the cell. Enter **0.12** into X or Y (the other will update automatically). Move the cursor and use the Data button to resize the cell.

E.5. **Position the vehicle turn template** so that the inside rear axle path of the bus (right solid white line of the vehicle turn template) is touching Line E (blue vertical line) (green bulls eye below) (***Hint:*** you may want to place the cell in the approximate location then use the Move command, identify the element using the Keypoint Snap  to the inside rear axle path of the bus, and identify the final point using the Nearest Snap Point  to Line E)



and that the inside rear axle path of the bus (right solid white line of the vehicle turn template) is touching at the end of Line F (blue line at angle) (green bulls eye below) (***Hint:*** you may want to use the Move command with Settings -> Locks -> Axis, identify the element using the Keypoint Snap  to the inside rear axle path of the bus, identify the final point using a Data Point near Line E, Zoom In, and repeat as necessary; be sure to turn Settings -> Locks -> Axis off).



E.6. Ensure that the yellow clearance lines of the vehicle turn template are inside the adjacent lane edges at the top (Line B) and bottom on the right (Line D).

F. Construct a circular arc curb return.

F.1. Set the active **color** to **orange (color=6)**.

F.2. **Construct a circular fillet using Line C and Line D.**

F.2.a. From the MicroStation Main Tool menu, select the **Modify** palette (last row right icon).

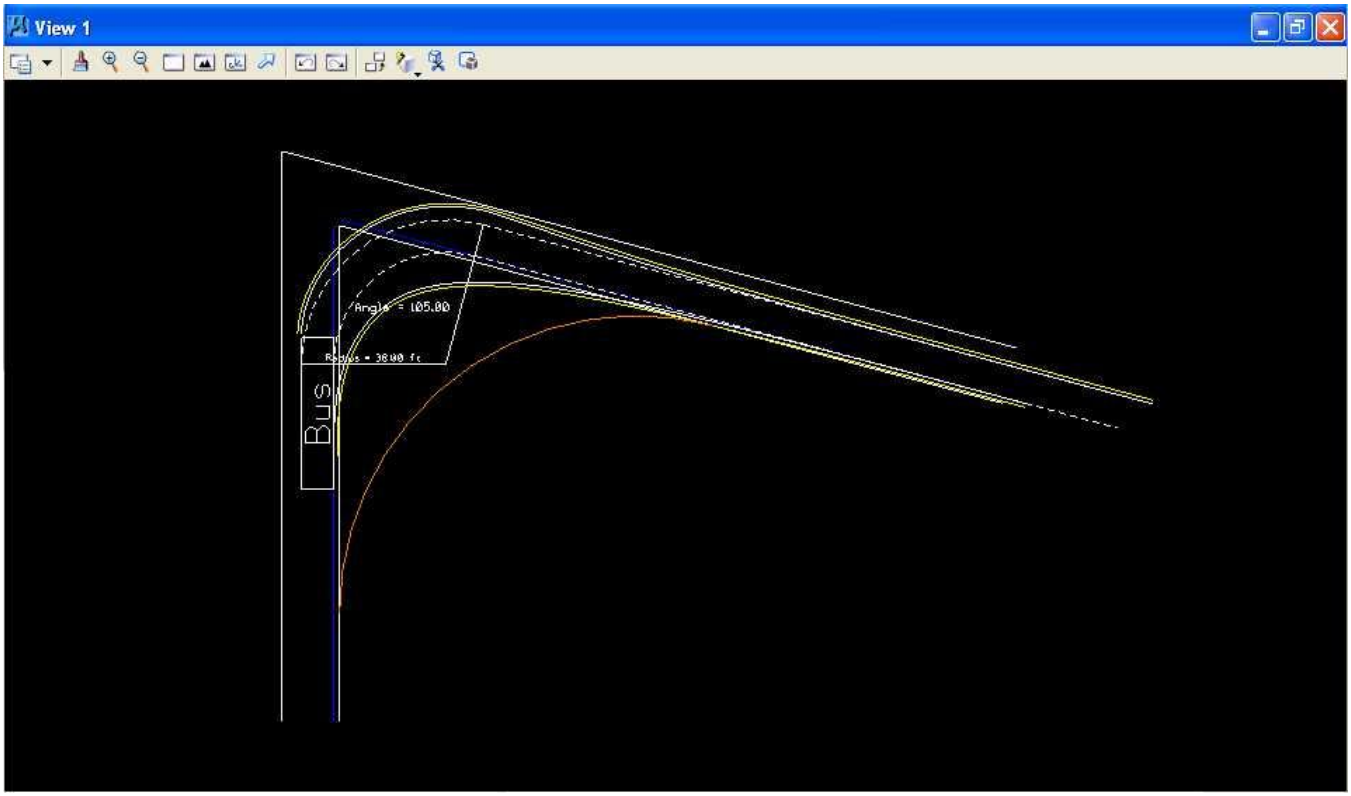
F.2.b. From the Modify palette, press the **Construct Circular Fillet** icon (third to last icon from the left).

F.2.c. In the Construct Circular Fillet dialog box, enter a **Radius** of **50** feet and set the **Truncate** option to **None**.

F.2.d. Move the cursor over **Line C** and press the **Data** button; Line C should be highlighted. Move the cursor over **Line D** and press the **Data** button; Line D should also be highlighted and a circular fillet of 50 feet drawn. (***Hint:*** you may want to open Window 2, make the size of Window 2 very small, and zoom in Window 2 very close on the intersection of Line C and Line D and then zoom in Window 1 near where the orange circular fillet is closest to the inside rear axle yellow clearance path; be sure to use the zoom controls for each window.)

F.2.e. If the orange circular fillet crosses the inside rear axle yellow clearance path then **Undo** the Circular Filet by choosing **Edit -> Undo Circular Filet (no truncation)** and **repeat instructions F.2.c**

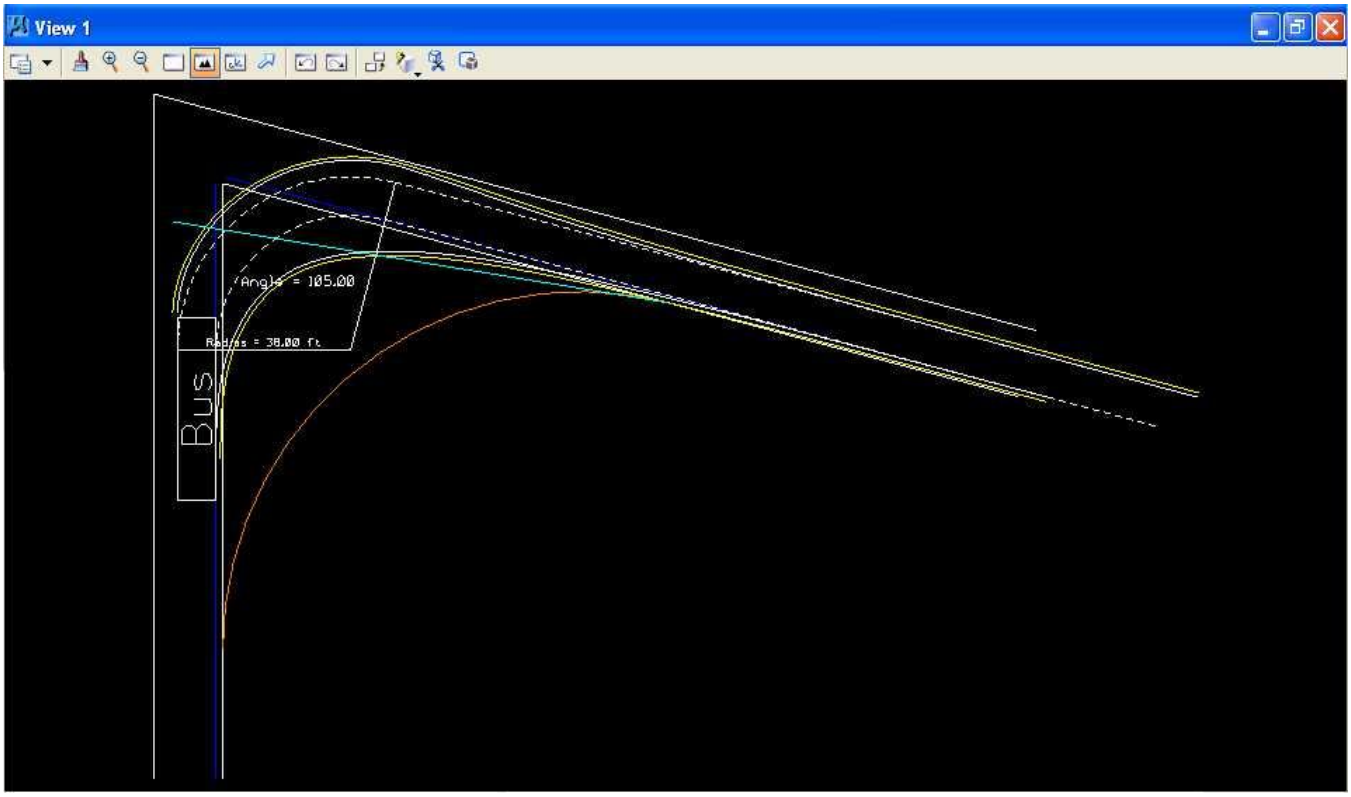
through F.2.d changing the radius in 5-foot increments and then 1-foot increments and then 0.1-foot increments until the minimum radius orange circular fillet is found that does not cross the inside rear axle yellow clearance path.



G. Use MicroStation to draw the 1:10 taper section line.

G.1. Set the active **color** to **light blue (color=7)**.

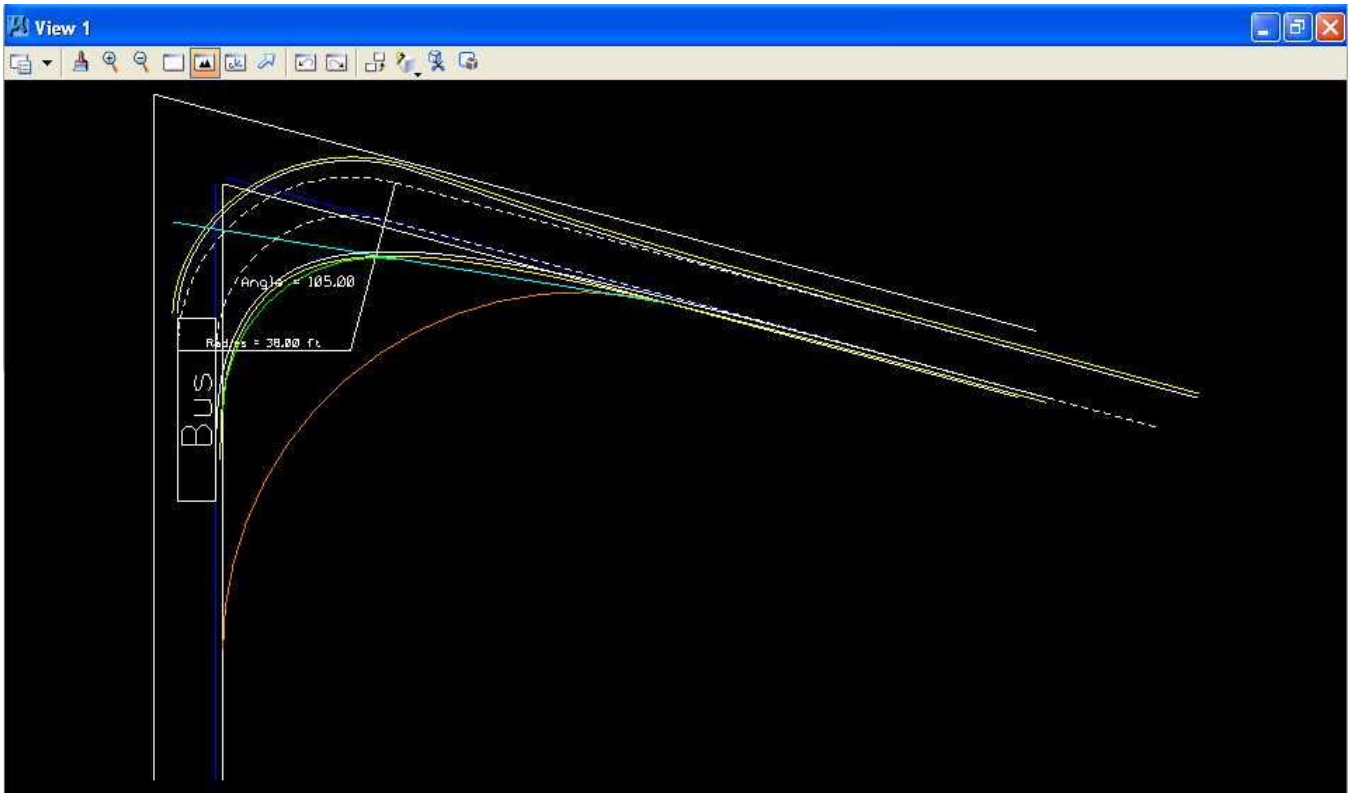
G.2. **From the intersection of Line D (the bottom edge of the lane on the right (white line)) and the inner edge yellow clearance line of the vehicle turn template, draw a 110 foot 1:10 taper section line relative to Line D towards Line C (the right edge of the lane on the left (white line)) as shown below** (***Hint:*** Line D was placed at an angle of 165 degrees; use Start -> All Programs -> Accessories -> Calculator with View -> Scientific to determine the angle for the 1:10 taper section using the inverse tangent function; use 4 decimal points of accuracy for the angle; then use the calculator to add the 165 degrees to find the angle for the taper section line) (***Hint:*** you may want to use the intersect snap  when placing the taper section line; because the inner edge yellow clearance line is a line string made up of many short (less than 1 foot) line segments, you have to zoom in very close to the intersection of the 2 lines to make the intersect snap work properly; the intersect snap will project whatever short line segment you choose to intersect with the other line even if another short line segment actually crosses the line at another place).



H. Use MicroStation to construct a circular arc pavement edge.

H.1. Set the active **color** to **green (color=2)**.

H.2. **Construct a circular fillet using Line C (the right edge of the lane at the bottom (white line)) and the taper section line starting with a radius of 50 feet with the Truncate option set to none. Repeat the construction of the green circular fillet changing the radius in 5-foot increments and then 1-foot increments and then 0.1 foot increments until the *minimum* radius green circular fillet is found such that the inner rear axle yellow clearance path does not cross the green circular fillet.** (***Hint:*** you may want to open Window 2, make the size of Window 2 very small, and zoom in Window 2 very close on the intersection of Line C and the taper section line and then zoom in Window 1 near where the green circular fillet is closest to the inside rear axle yellow clearance path; be sure to use the zoom controls for each window.)

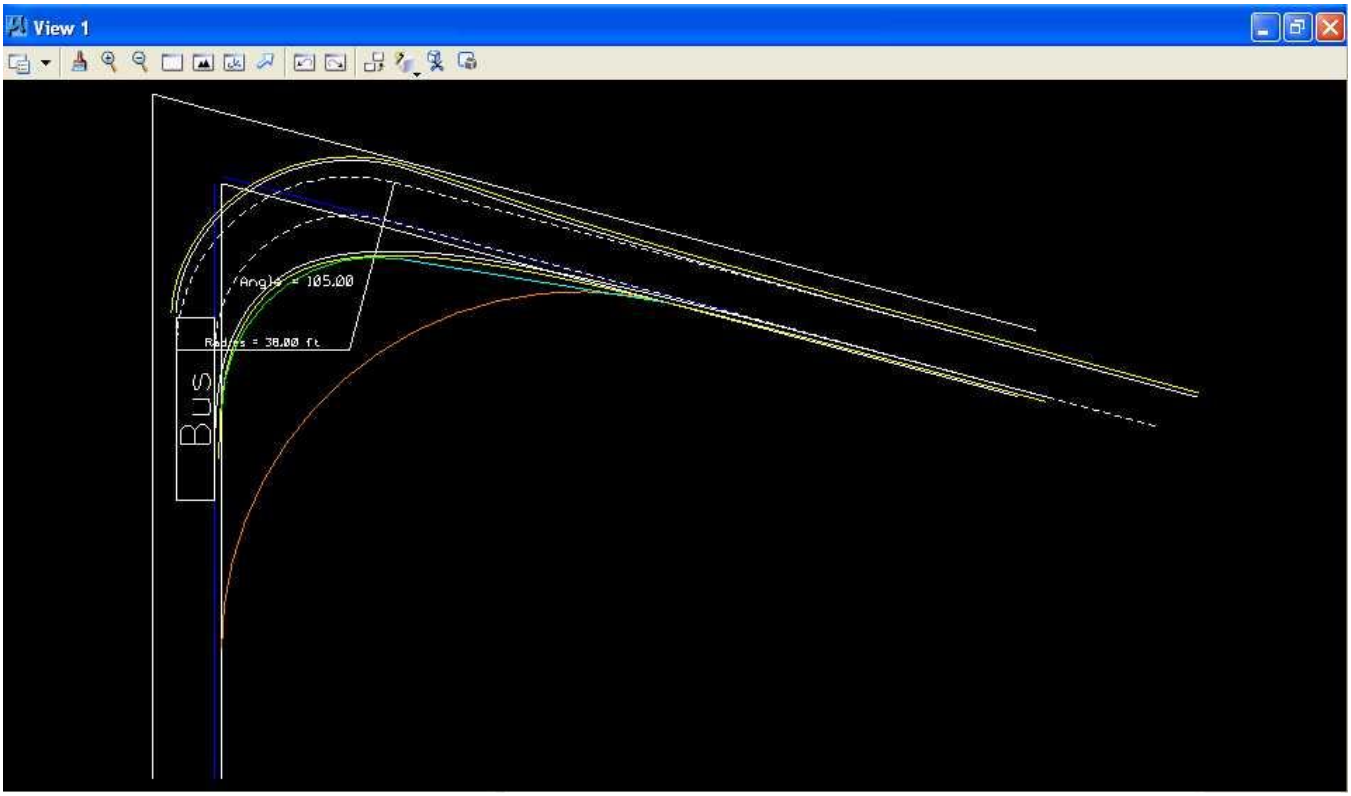


I. Use MicroStation to extend the taper section line to the green circular arc.

I.1. From the MicroStation tool palette, select the **Modify** palette (last row right icon).

I.2. From the Modify palette, choose the **Extend Element to Intersection** icon (5th icon from left)  .

I.3. Place the cursor over the **taper section line to the right of the green circular arc** and press the **Data** button; the taper section line should be highlighted. Place the cursor over the **green circular arc** and press the **Data** button; the circular arc should also be highlighted and the taper section line extended (shortened) to the circular arc. If this command does not seem to work, you may have to use the **Extend Element** icon (3rd icon from left)  to extend (shorten) the taper section line to the circular arc.



J. Use MicroStation to measure, crosshatch, and dimension the area between the two pavement edges.

J.1. **Turn Level 1 display off.**

J.1.a. In the MicroStation window, choose **Settings -> Levels -> Display**.

J.1.b. In the Level Display dialog box, set **Level 1** to **off** and **close** the Level Display dialog box (this should cause the vehicle turn template to be not displayed).

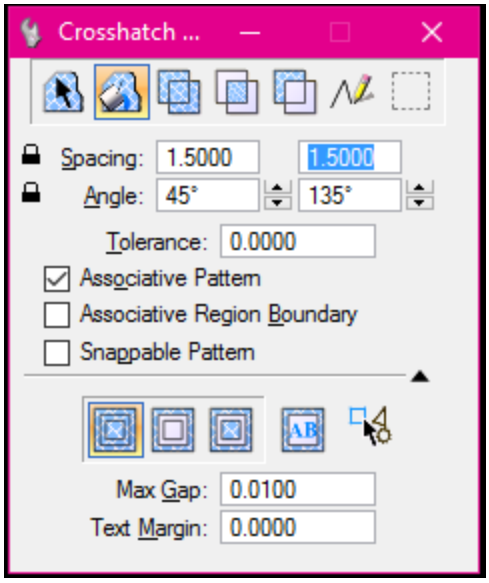
J.2. **Measure Area** the area between the two pavement edges (setting **Method** to **Flood** and clicking in the area bound by the two circular fillets) and **record the value** of the area to the nearest integer number.

J.3. Set the active **color** to **white (color=0)**.

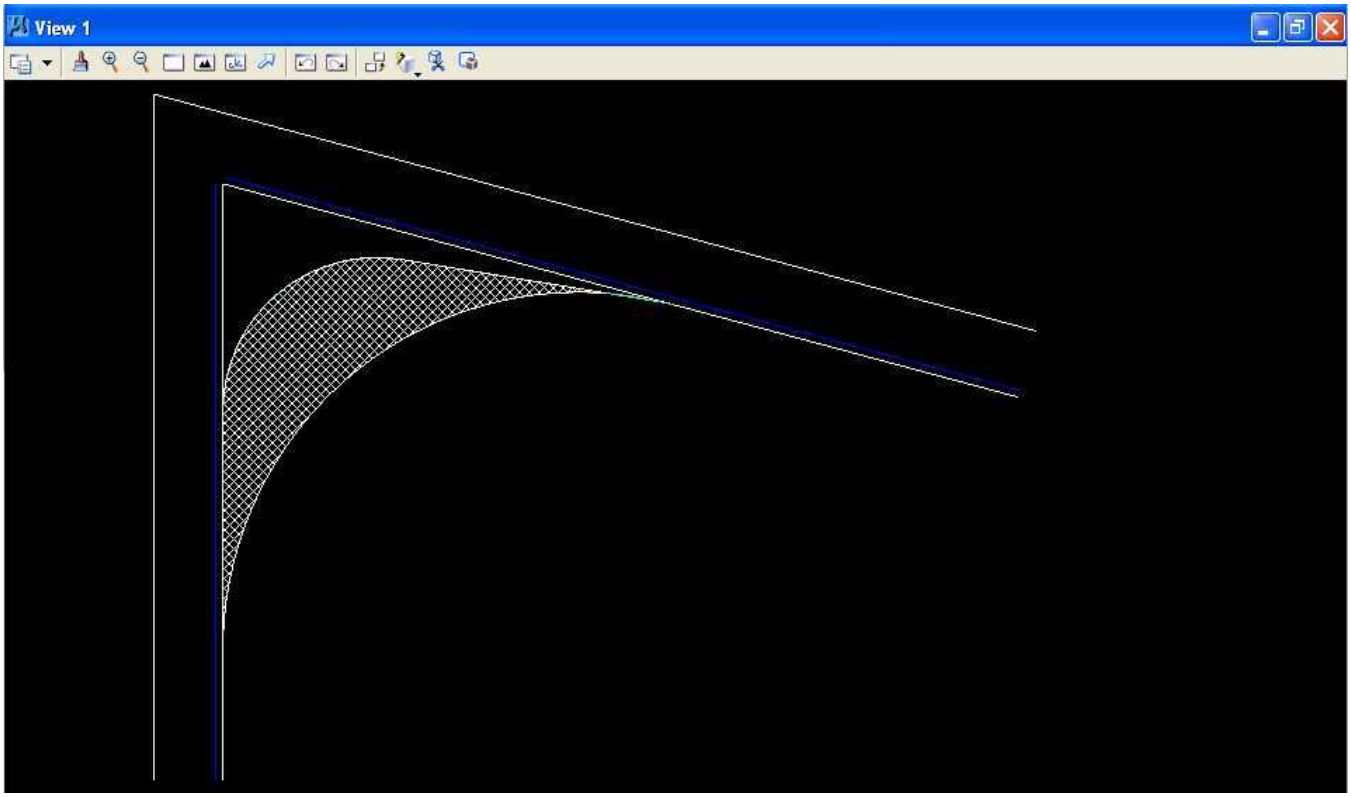
J.4. From the MicroStation tool palette, choose the **Patterning** palette (3rd row left icon).

J.5. From the Patterning palette, choose the Crosshatch Area icon (2nd icon from the left)  .

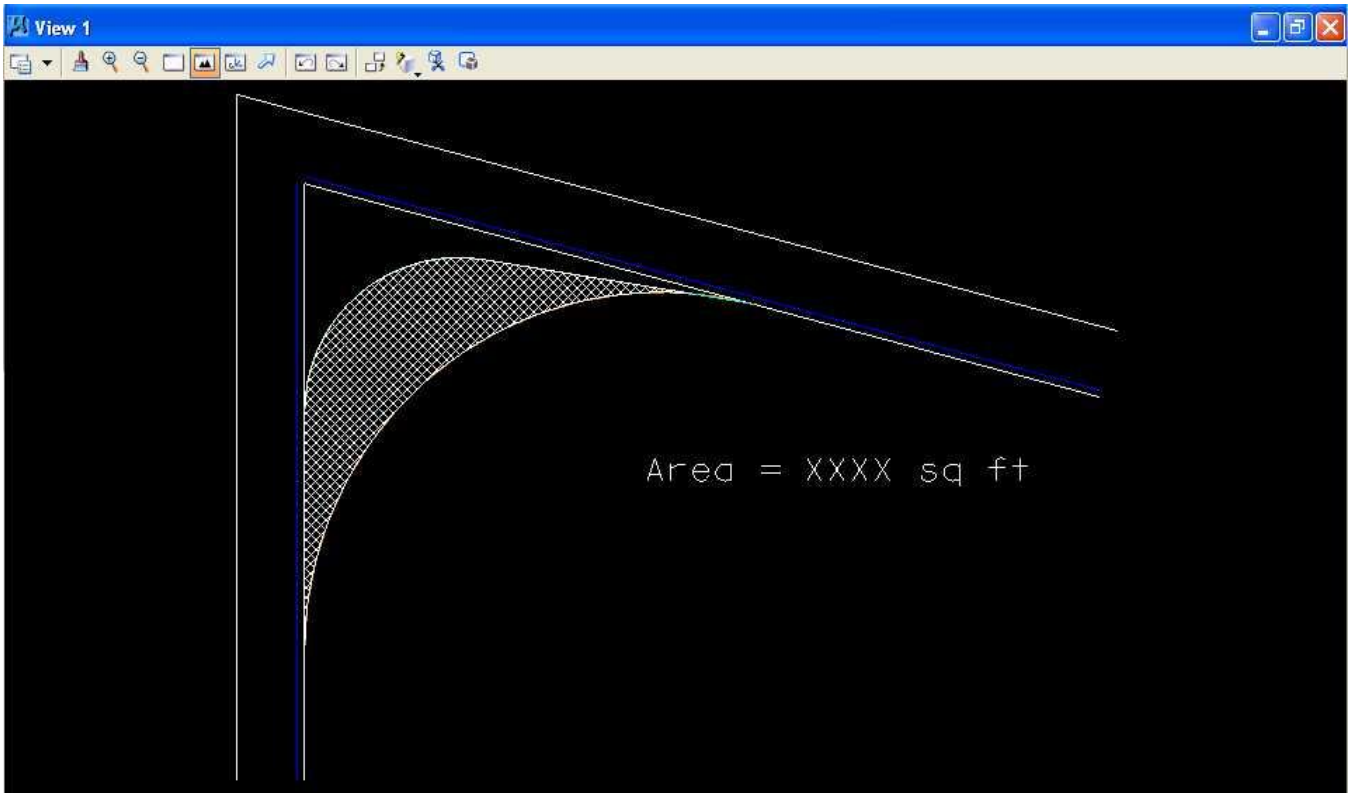
J.6. From the Crosshatch Area dialog box, press the **Flood** icon  **,** set **Lock Spacing** by pressing the lock to the left of the Spacing label**,** set **Spacing** to **1.5**, set **Angle** to **45**, set **Tolerance** to **0**, set **Associative Pattern** to **on**, set **Associative Region Boundary** to **off**, set **Snappable Pattern** to **off**.



J.7. Move the cursor to the **center** of the area between the two pavement edges, press the **Data** button, and press the **Data** button **anywhere** to accept the highlighted area.



J.8. **Place text "Area = XXXX sq ft" using the value from Step J.2 with Active Angle set to 0.0, Active Color set to white (color=0), text height of 5, text width of 5, text line spacing of 5 feet, and font of 3 (font=ENGINEERING).**



K. Use MicroStation to dimension the two circular arcs and the taper section.

K.1. **Use MicroStation to dimension the first circular arc (orange circular arc).**

K.1.a. Set the active **color** to **orange** (color=6).

K.1.b. In the Dimension Styles dialog box, choose **Text**; in the Style group, set **Text Style** to **Style (none)** and **deselect Font, Height, Width, and Underline**; in the Format group, set **Orientation** to **Aligned**, **Location** to **Above**, **Justification** to **Center > Left**, **Text Frame** to **None**, **Left Margin** to **0.5**, **Lower Margin** to **0.5**; and in the **Stacked Fractions** group, **deselect Enable**.

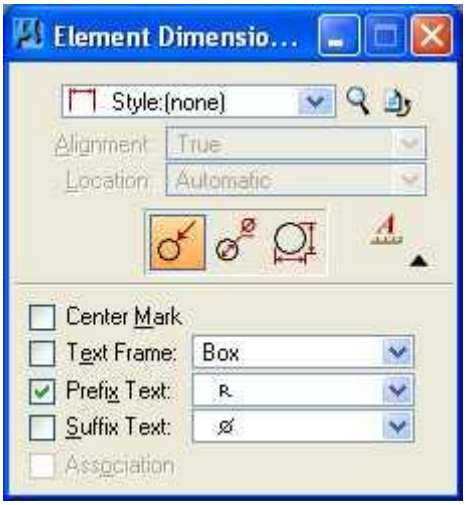
K.1.c. In the Dimension Styles dialog box, choose **Units**; under the **Primary Units** group, **select Use Working Units**, set **Label Format** to **MU**, set **Accuracy** to **0.1234**, **select Leading Zero**, and **deselect Trailing Zeros** and **Alternate Label**; under the **Secondary Units** group, **deselect Show Secondary Units**; under the **Scale** group, **select Reference Scale** and set **Scale Factor** to **1.0**; in the **Metric Format** group, **deselect Use Comma for Decimal**; and in the **Angle Format** group, set **Units** to **Angle**, set **Display** to **D.DDDD,** set **Accuracy** to **4 decimal places**, **select Leading Zero,** and **deselect Trailing Zeros**.

K.1.d. From the MicroStation tool palette, select the **Dimensions** palette (row 7 right icon).

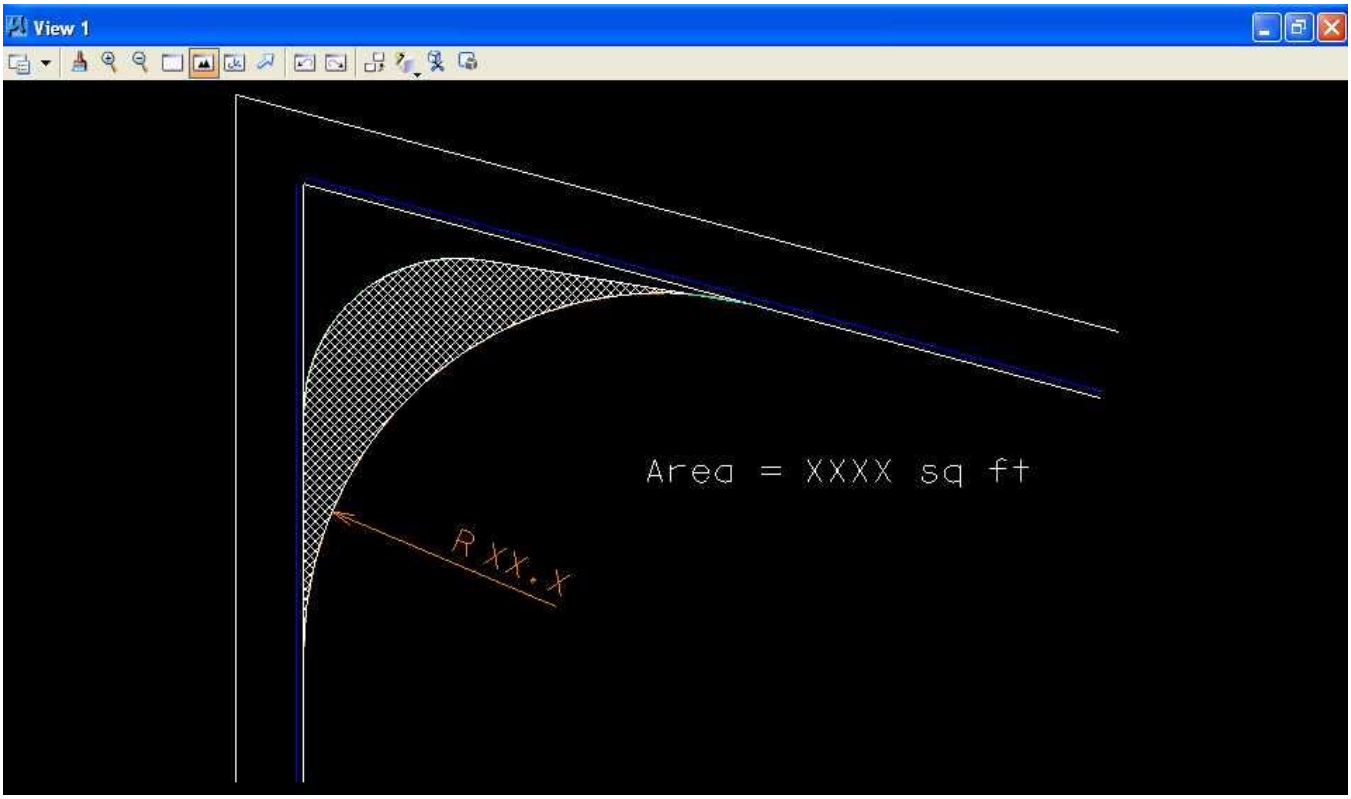
K.1.e. From the Dimensions palette, choose the **Dimension Element** icon (leftmost icon).

K.1.f. Place the cursor **over the orange circular arc** and press the **Data** button.

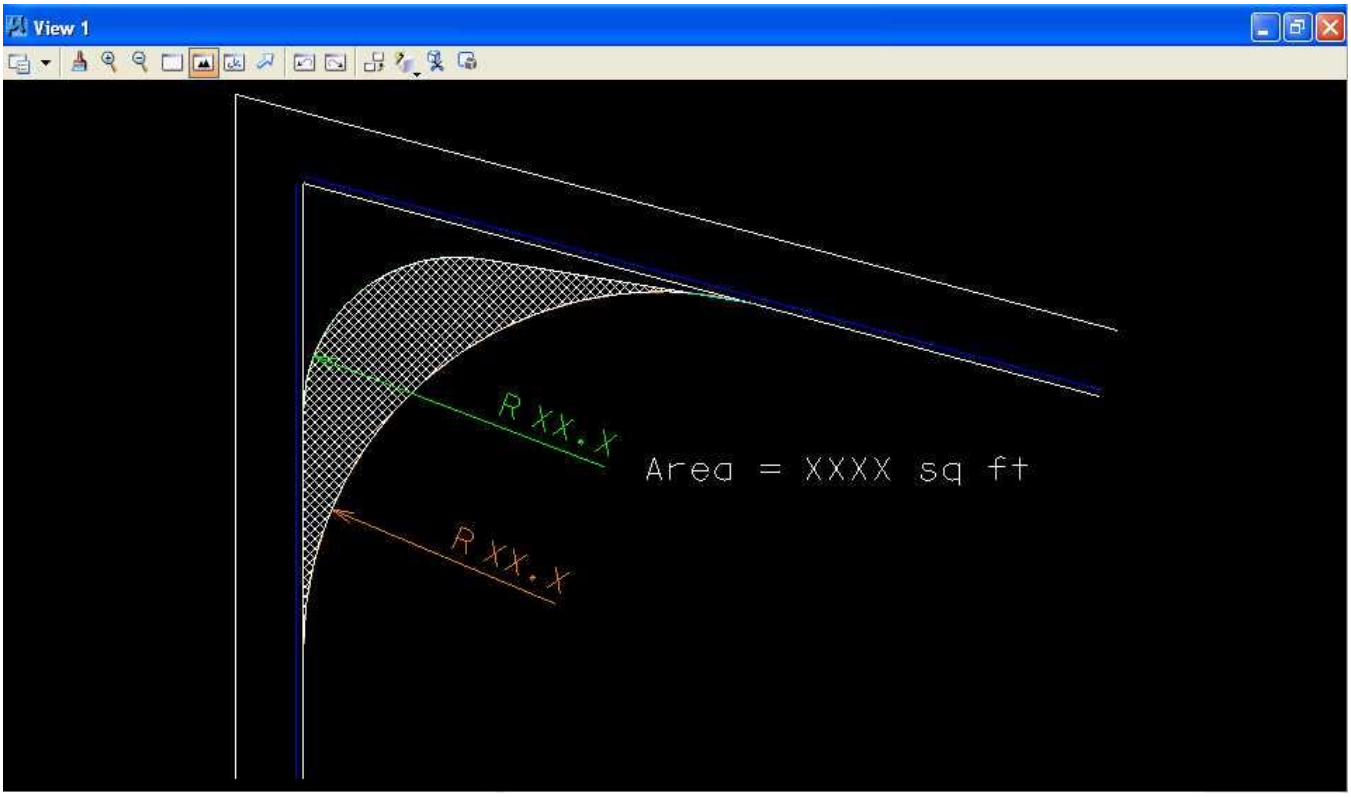
K.1.g. From the Element Dimensioning palette, choose **Style: (none)**, choose the **Dimension Radius** icon (leftmost icon)  and **deselect Center Mark**, **deselect Text Frame**, **select Prefix Text**, set **Prefix Text** to **R**, and **deselect Suffix Text**.



K.1.h. Move the cursor until the dimension is similar to the plot below and press the **Data** button to accept the placement.



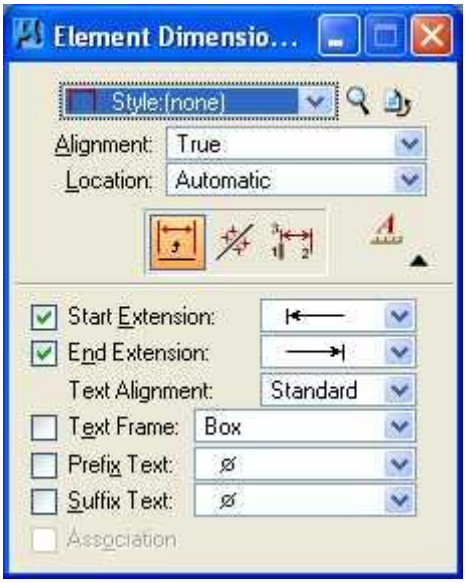
K.2. **Use MicroStation to dimension the second circular arc (green circular arc) with color set to green (color=2)**.



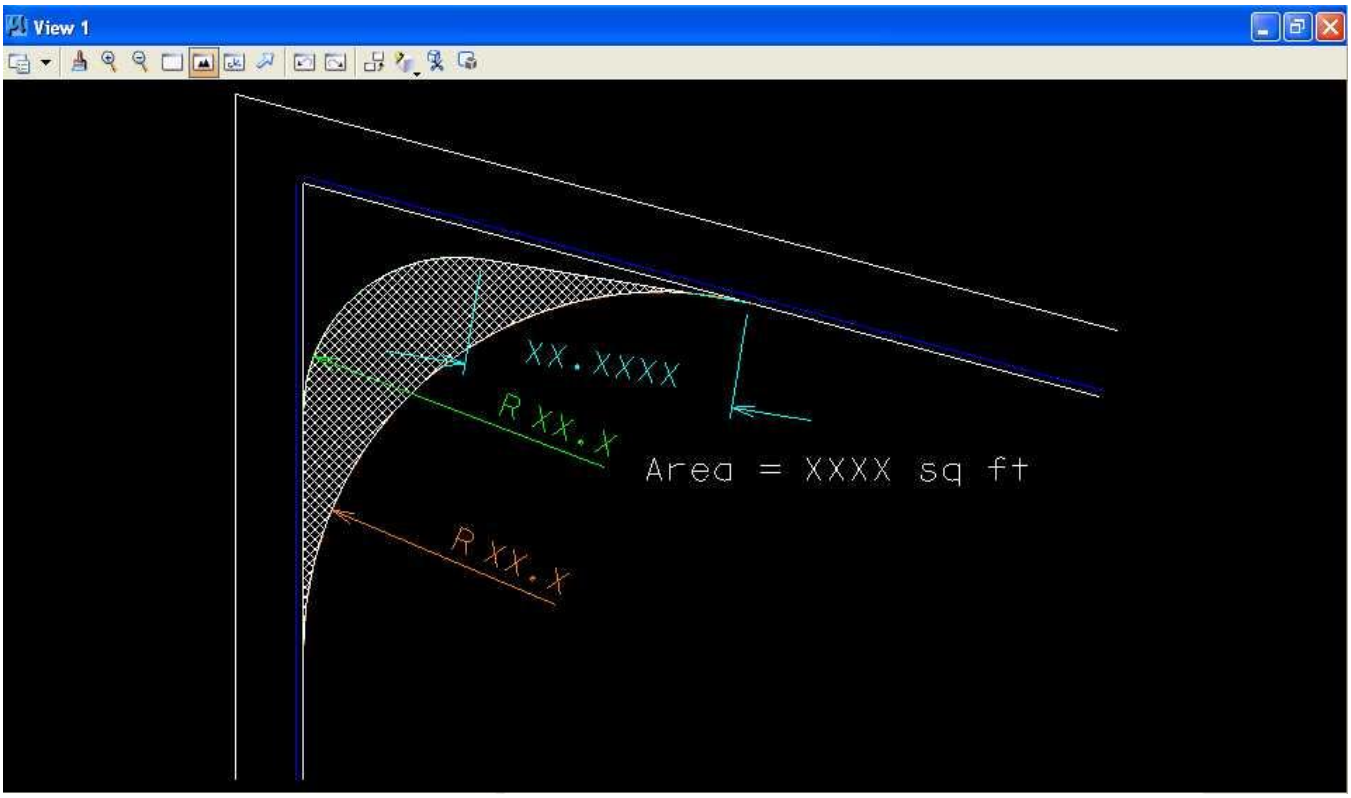
K.3. **Use MicroStation to dimension the taper section line (light blue line) with color set to light blue (color=7).**

K.3.a. Place the cursor **over the light blue line** and press the **Data** button.

K.3.b. From the Element Dimensioning palette, choose **Style: (none)**, set **Alignment** to **True**, set **Location** to **Automatic,** choose the **Dimension Element** icon (leftmost icon)  and **select Start Extension**, set **Start Extension** to **Arrow**, **select End Extension**, set **End Extension** to **Arrow**, set **Text Alignment** to **Standard**, **deselect Text Frame**, **deselect Prefix Text**, and **deselect Suffix Text**.



K.3.c. Move the cursor until the dimension is similar to the plot below and press the **Data** button to accept the placement.

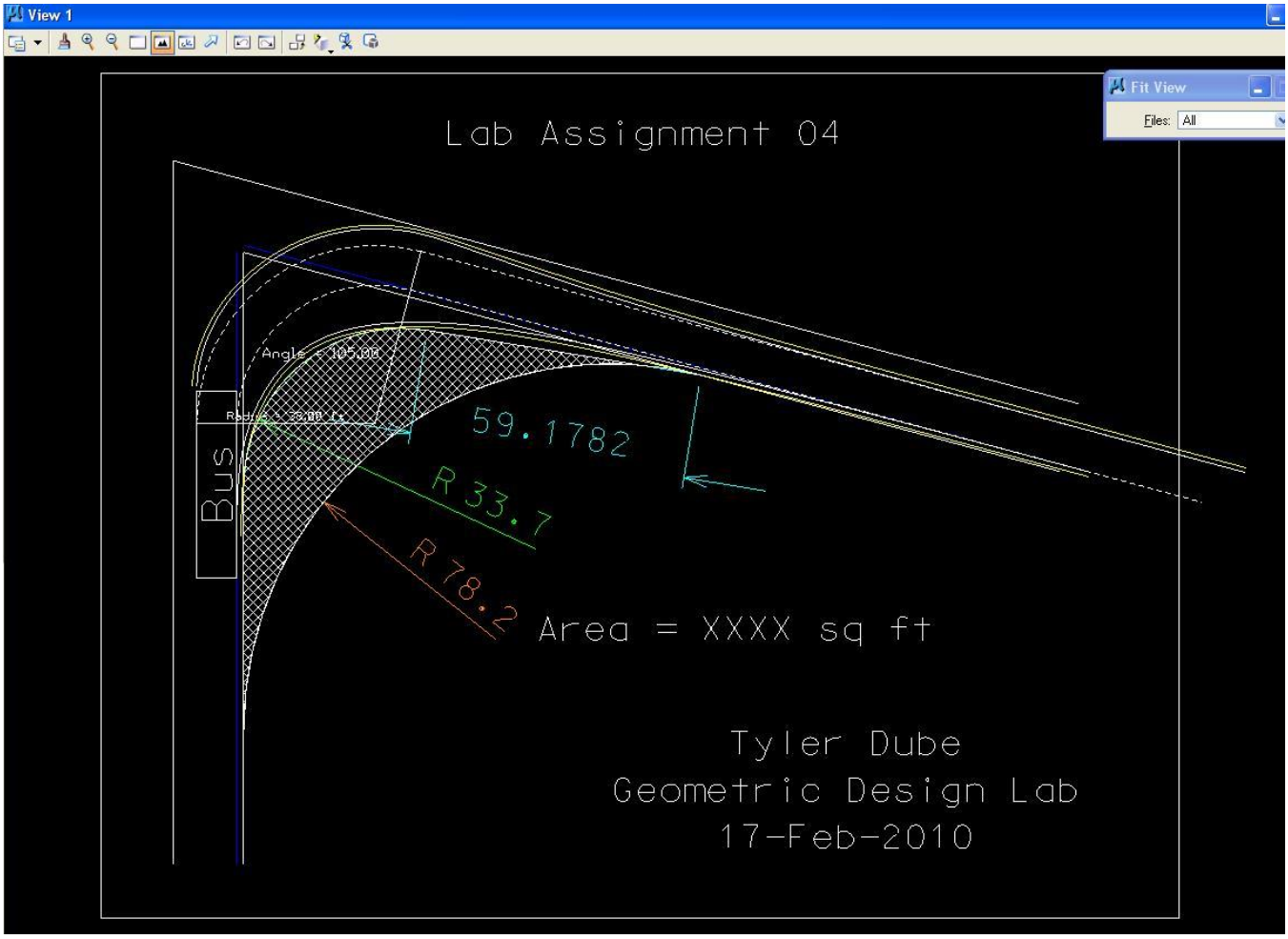


L. Turn Level 1 display on.

M. Place a landscape oriented rectangle centered around the intersection in 8.5" by 11" proportion (230 feet by 180 feet) with level of Default (level=Default), color of white (color=0), style of solid (style=0), and weight of 0 (weight=0).

N. Place the title "Lab Assignment 04" at the top right and your name, class name, and assignment due date in the lower right at a text height, text width, and text line spacing of 5 feet with font of 3 (font=ENGINEERING), justification of Center Center, level of Default (level=Default), color of white (color=0), style of solid (style=0), and weight of 0 (weight=0).

O. Place a fence from the rectangle placed in Step M and plot the drawing using ENGR-SC2-Laser-2ENGR-SC2-Laser-2 and options for Fence, Monochrome, Letter, Landscape, a Scale of 25 ft / in, and Settings -> Print Attributes -> Fence boundary off and Print border on.



Pavement Edge Design with a Simple Arc of a Circle and with a Taper Section and an Arc of a Circle Plot

P. Exit MicroStation.

Q. Reboot the computer

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