CET-2030 Construction Graphics
Inroads Existing & Proposed Surface Creation Summary

Step 1 Graphics File Set up

Create a folder within your student drive **H:/CET2030/INROADS** for storage of our surface files while working in Inroads.

Work in the following files:

- For existing surface creation, you may work in any of your files that have TOPO referenced. However, it may be best to work in SITE.
- For proposed surface creation, elements should be put at elevation in a copy of your site file and surface work performed in that copied file (SITEX).

Step 2 Load Inroads

Inroads is entered from the Microsoft Start>Programs>Bentley > Inroads XM Group> Inroads icon. This path will start Microstation and allow you to call up a file from the Microstation Manager area. As the file loads, Inroads will also be loaded. The Bentley Inroads main control window will appear on the screen from which to operate Inroads commands.

Step 3 Import Surface from Graphics

1. From the Inroads control window choose File>Import>Surface
2. Using the Import Surface Tool, From Graphics Tab, enter the following information:
    a. **Surface: Enter a name** for your surface to be created or one to be added to. Be descriptive with your name. (**topo, site, road**)
    b. Load From: **Level**, **Fence** (use a clip fence) or Individual **Element**
    c. Level: Choose the level you are extracting if using this option.
    d. Elevations: **Use Element Elevations**.
    e. Seed Name: Enter a **name** for Inroads to **name points** in the surface. Try to use the surface name.
    f. Feature Style: Enter the **type of objects** you are extracting. These are Inroads features.
    g. Point Type: Enter the type of points you are extracting. (**Contours, Random, Breaklines, etc.**) These are semi-critical entries.
    h. Maximum segment length: Determines the maximum length a line segment can reach before it is subdivided into smaller segments. **50' to 100'** is a good length.
    i. Point Density Interval: Requires the software to insert more triangles along a line at the distance you specify. **10'** for **SITE** is good, **0** for **TOPO**.
3. Hit the apply button and follow status bar commands. The surface now has elements to work with. Point data should be shown in the Surface Tab Window under the name of the surface you created.

4. Save the surface after importing using File>Save As. Save the surface as a .dtm file in your **H:/CET2030/INROADS** folder using the name entered in the extract graphics command.

Step 4 Triangulate the Surface

1. With the new surface highlighted in the Surface Tab Window, (this is your active surface) Triangulate the surface using the Surface>Triangulate Command.
2. From the Triangulate Surface Command Window, enter the following information:
    a. Surface: **Select** the surface you want to triangulate.
    b. Check **on Extended Data Checks** for the command to look for crossing segments. Use the View Crossing segments command to find these errors.
    c. **Maximum Triangle Lengths**: This is the length at which triangles greater than will be deleted. This has to be chosen carefully so that triangles over large expanses where no data is present are not summarily left out of the surface. (**200'** for **TOPO** and **less** for **SITE**.)
    d. Check **on Delete Surface Contents** to start with an empty new surface deleting all the old triangle data.
3. Press **apply**.
4. Save the surface after triangulation using File>Save. This will automatically save the surface in its previous location.

Step 5 Review and Edit Your Surface

1. Write in your triangles to the file. Use **Surface>View Surface>Triangles**.
    a. Choose the correct surface to view.
    b. Chose an unused level that is on in the file in which you are working and use the Edit command to select that level.
    c. **Apply** to view and write in the triangles into the file.
2. Did the triangles cover every part of the intended area? Did the triangles completely incorporate all imported elements? If not, re-triangulation with a longer minimum side may be required or elements may be missing from the import of graphics.
3. Use a side or front view to look at the triangles to see if any points at odd low or high elevations were picked up by the importation. You may need to delete these points from the Microstation file and redo the process again after deleting these bad points.
4. Delete the triangles from the Microstation file **view** using a graphic group lock.
5. From the Top View delete any triangles that jump across the exterior border of the surface in concave corners. Use **Surface>Edit Surface>Delete Triangles**. Select the surface to work on. Hit apply and drag a line to select the triangles to be deleted. Accept with a Data Point (Left) Click. DO NOT retriangulate the surface after deleting the triangles. This will only bring back the bad triangles.

Step 6 Save All Files Properly

1. Save all surface files upon which you worked in the correct **H:/CET2030/INROADS** folder. Inroads will not do this automatically.
2. **File>Compress>Design,** the .DGN file after Inroads manipulations in order to reduce the size of the file due to deleted element remnants. **Save any changes** made to your .DGN file using Microstation save procedures.

Step 7 Model the Proposed Work to the Ground

Proposed surfaces require that your proposed site be drawn at elevation and be "sealed" where it is to meet the existing surface. Slope touchdown lines can be designed to a specific slope from a known element, or be arbitrarily placed at no particular slope.

Slope to Surface Command (Produces a Top/Toe of Slope from a known element at elevation to a known surface at a given slope.)

a. Surface>Design Surface>Generate Sloped Surface

b. From the **Main Tab**, Select :

i. Intercept Surface: The name of the surface to which you are touching down. (usually **Topo**)

ii. Destination Surface: **Default** (No proposed surface yet exists.)

iii. Interval: **10'**

iv. Cut & Fill Slopes in %. **+ for Cut** (up) and **– for Fill** (down)

v. Check on **Catch Point** and **Generate Graphics Only**.

c. Hit **Apply** and follow the commands in the status bar.

Generate Longitudinal Feature (Used to produce a line draped along a surface at a point at which you determine the toe/top of slope.)

a. Surface>Design Surface>Generate Longitudinal Feature

b. From the **Main Tab** Chose the following:

i. Surface: Chose the surface to drape the line on (usually **Topo**).

ii. Reference Feature Interval: **10** (Distance of element subdividing)

iii. Longitudinal Feature: Mode: **New**

iv. Feature Style: **Toe of Slope**

v. Check on **Generate Graphics only**.

c. From the **Controls Tab**, **Vertical**, select **Drape** and the **Surface name**.

e. Hit **Apply** and follow the commands in the status bar.

Step 8 Create the Proposed Surface

Once the proposed work is modeled to the ground and the entire site is sealed, repeat the steps for Surface Creation, Review and Editing in order to create a surface for the proposed work. Import the SITEX named levels to your surface.

Helpful Hints for Inroads

- Save your surfaces and other Inroads files often! Software crashes will lose all your work.
- Make sure you are operating on the correct active surface by left clicking on it in the Surface Tab Window or going to **Surface>Active** and specifying it.

Proposed Surface File Set-up Tips

1. Offset vertical surface lines by 0.01' to avoid "true" vertical surfaces.
2. Break lines should not intersect. Extend all lines -0.01 from each other to avoid the intersection.
3. Add diagonal break lines along inflection points in "flat-dish" graded areas.
4. Edit lines to elevation by using the move, modify and copy commands with the DL= key-in. Or use the Generate Longitudinal Feature command in Inroads with the correct offsets if the modify or copy parallel give strange results in 3D files.
5. Corner radii can be placed as an arc at elevation using the Place Arc command with the edge method with an additional point placed at the correct elevation at the mid-point of the arc. An approximation with several tangents around the curve at elevation can also be used. Using Inroads features is also an option.
6. Extract the graphics to the surface as break lines.