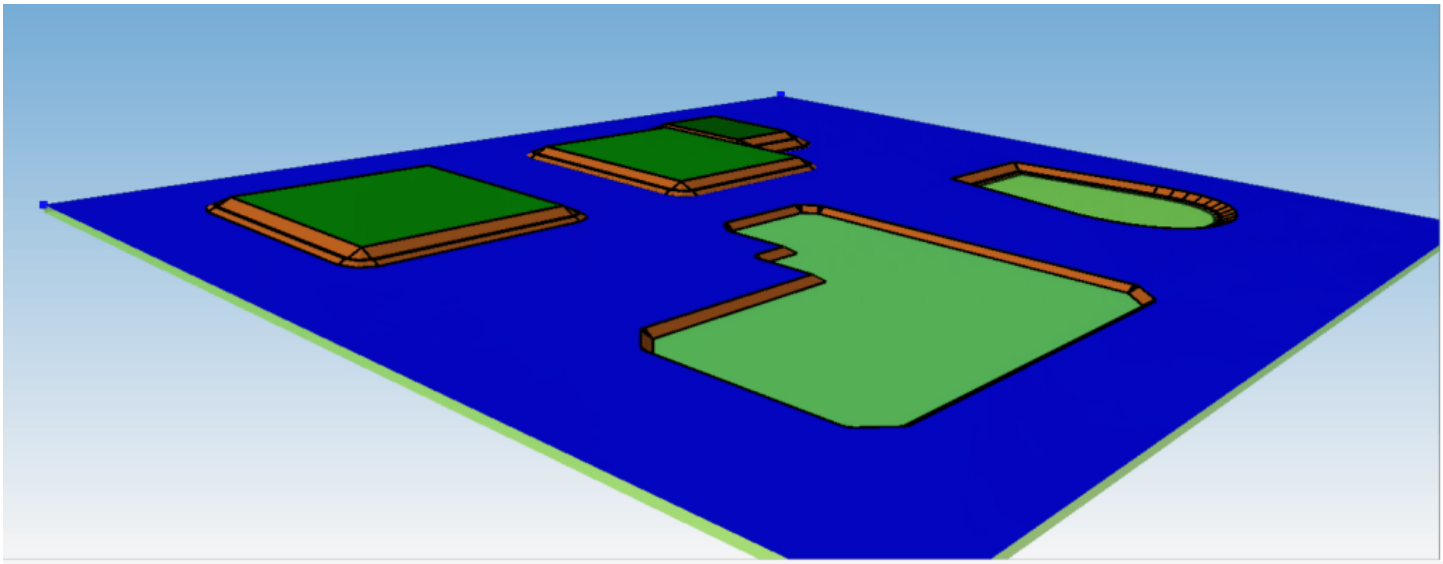
Cut and Fill Quantity Calculation: How Can We Create Platforms and Slopes with Drops in Civil 3D?

Civil 3D · https://mes100.com/docs/how-can-we-create-platforms-and-slopes-with-drops-in-civil-3d/



The illustration above showcases earthwork designs incorporating slopes and vertical drops between platforms of varying heights.

Slopes and berms in MiTS

In MiTS, generating such designs is straightforward, as the process is automated for users. Following the setup of platforms and slope parameters - such as platform height, slope direction, slope ratio, slope maximum height, and berm width - users only need to click the ‘Generate Slope’ button within the Earthwork Module.

Based on the disparity between the existing ground and platform height, MiTS initiates slope generation from the platform edges, and autonomously determines the number of tiers required and

when to cease the slope.

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Civil 3D Requires Feature Lines, Breaklines, and Boundary

In Civil 3D, users can utilize Feature Lines to design platforms that incorporate slopes and berms.

Feature lines are lines with defined elevation points set by users; They can be an absolute elevation or elevation relative to the associated surface. While this feature can indeed be utilized to depict the slopes and berms, it demands meticulous guidance from users, beginning with outlines representing the contours of the slopes and berms. Subsequently, users must manually calculate the height of the slope and determine the number of tiers required.

In order to accurately create the final surface from these outlines, it is essential to incorporate the Feature Lines into the surface definition as **Breaklines** (such as Standard or Wall Breaklines for vertical drops). Additionally, a **Boundary** must be utilized to precisely define the surface limits, thereby ensuring the resulting terrain follows the elevation of the outlines.

So, How Can Feature Lines, Breaklines, and Boundaries Be Applied in Our Design?

Drawing only with the platform line **here**.

Drawing sample with slopes and berms **here**.

Listed below are the steps involved in creating platforms with slopes and berms in Civil 3D.

Outlining Platforms and Slopes using Feature Lines

The outlines of the platforms and slopes will act as **base polylines**, which are crucial for creating wall breaklines later.

Platforms:

Create the outline following the shape of the platforms designed using **Feature Lines**. The elevation for each vertex should follow the *real elevation* of the platforms.

1. Go to Home tab > Click on Feature Line > Create Feature Line

2. Set the **Site**, **Name**, **Style**, and **Layer** accordingly > Click OK

3. Click on the first point > Set the elevation of the corner > Followed by the next point location and elevation

Users may refer to the tutorial video below for clearer steps.

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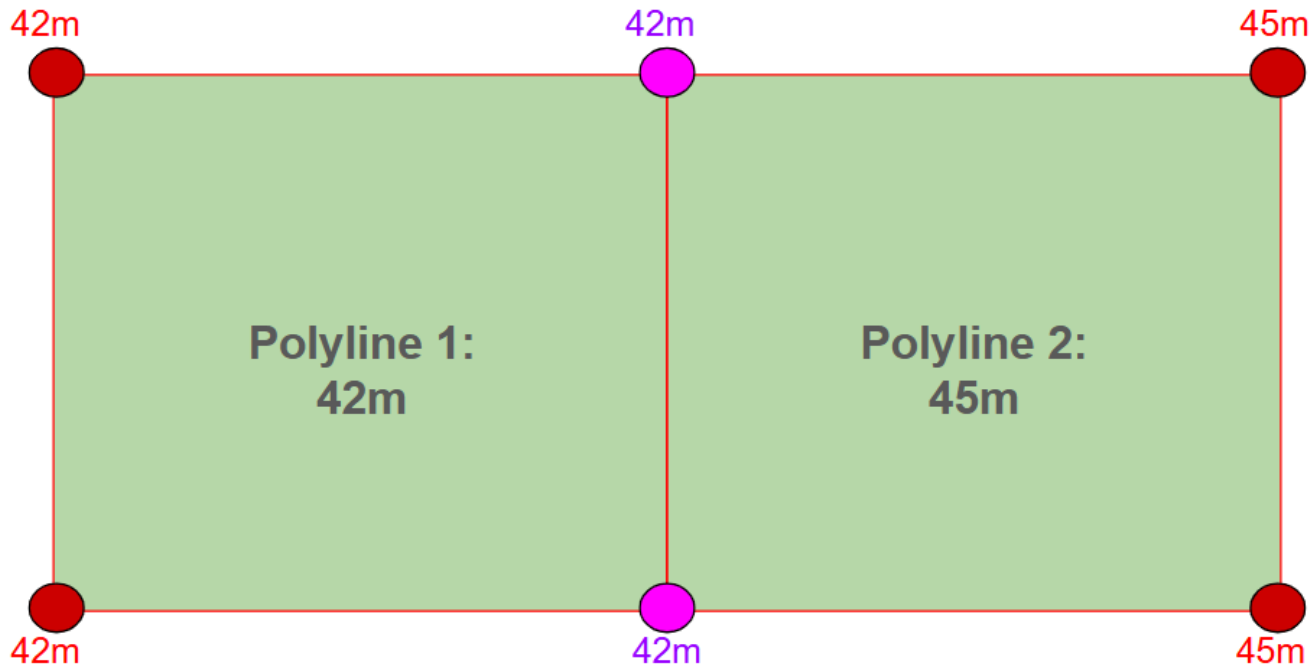
Platforms with vertical drop (Retaining Wall):

A side-by-side platform with the vertical drop will share an edge with common vertices. These vertices will be set with the **lowest elevation**, reflecting the bottom of the wall.



This is to adhere to the rule for breaklines, in which the **common vertices of the shared edges where the drop exists** (these vertices *must* have similar X and Y coordinates) **are set with similar elevation**.

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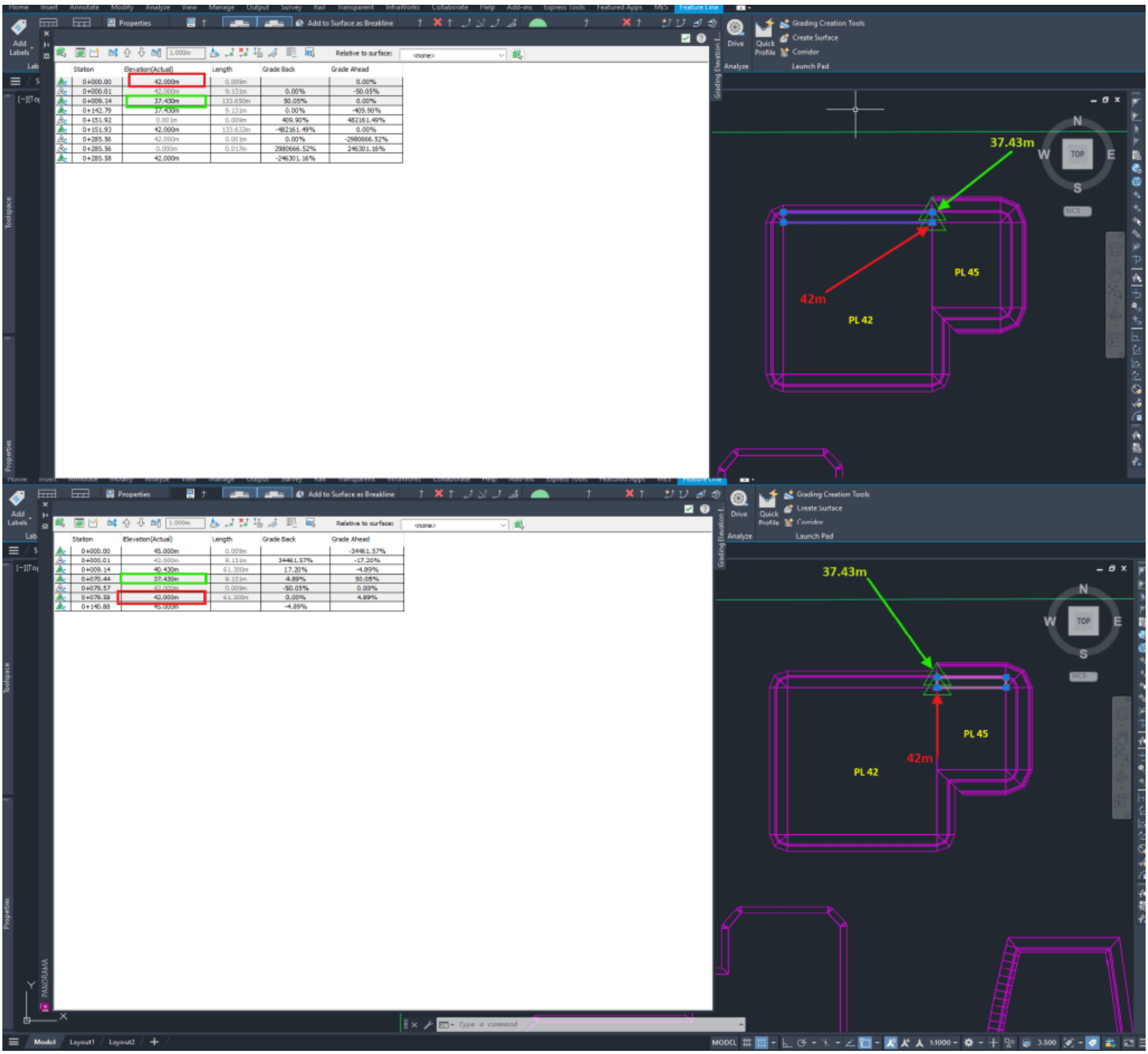
Note: The same concept will be applied for the elevation of slopes and berms with a retaining wall in between.



Slopes and Berms:

1. With a known height and ratio of the slope, calculate the width of the slope.

- Height of **4.57m** and a ratio of **1.5**, the width will be **6.75m**
- Height of **4.57m** and a ratio of **2.0**, the width will be **9.14m**
- The berm width will be **1.5m**

2. When determining the number of slopes and berms, users will need to take into consideration the difference between the ground levels and the platforms at that exact location. Manual calculation and input will be needed from users for this.

3. To easily create the berm and slopes, users can offset the platform lines according to the width calculated and trim the corners to follow an accurate slope representation.

   To offset, simply select the line > Type in command Offset > Specify the offset distance, opt for Through > Input the distance > Press Enter

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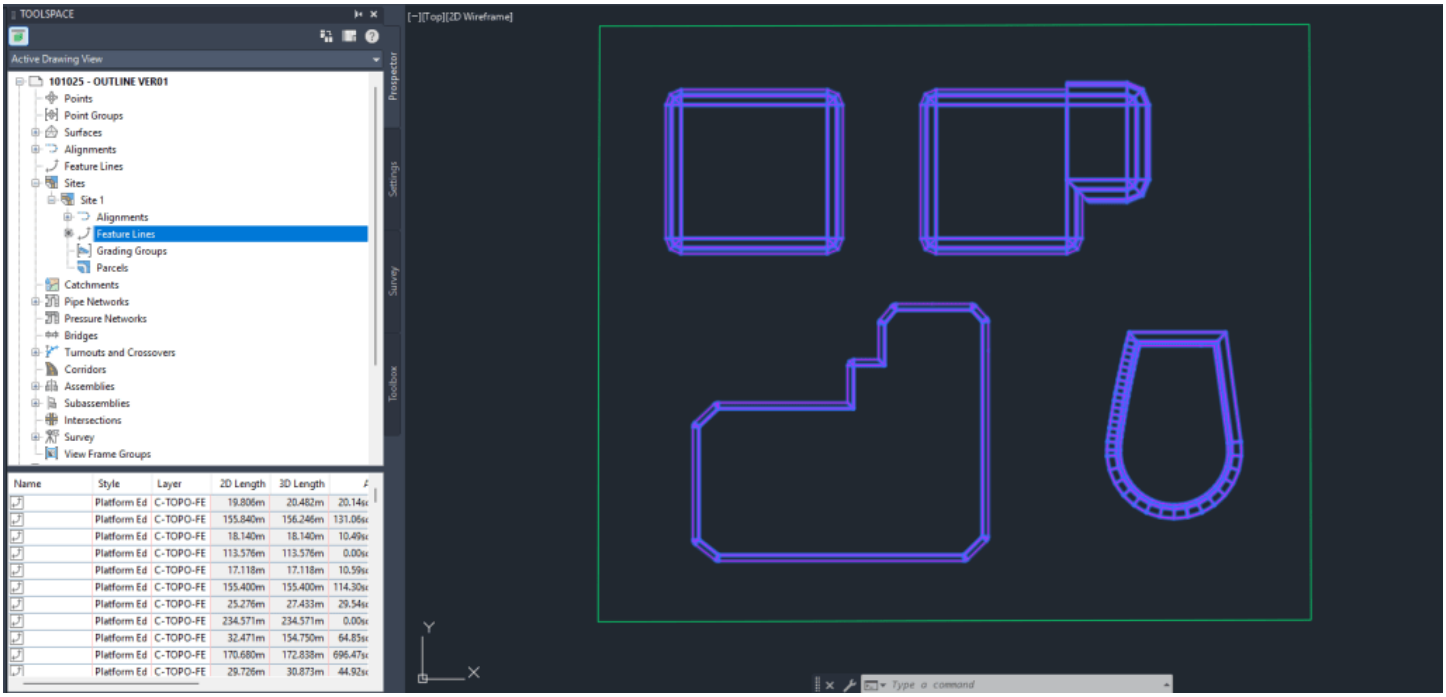

MiTS 2.0 and Above User Note:

Users of MiTS 2.0 and later versions can ***skip* the manual outlining** of slopes and berms above using Feature Lines.

These users can directly **export the Input Plan** from MiTS (which includes the slope and berm lines with elevations) and **convert the 3D polylines** to Feature Lines in Civil 3D.

As for platforms, the lines are in 2D, which requires users to redefine the elevation when they are converted to Feature Lines.

For a visual guide, users may refer to the video tutorial provided below.

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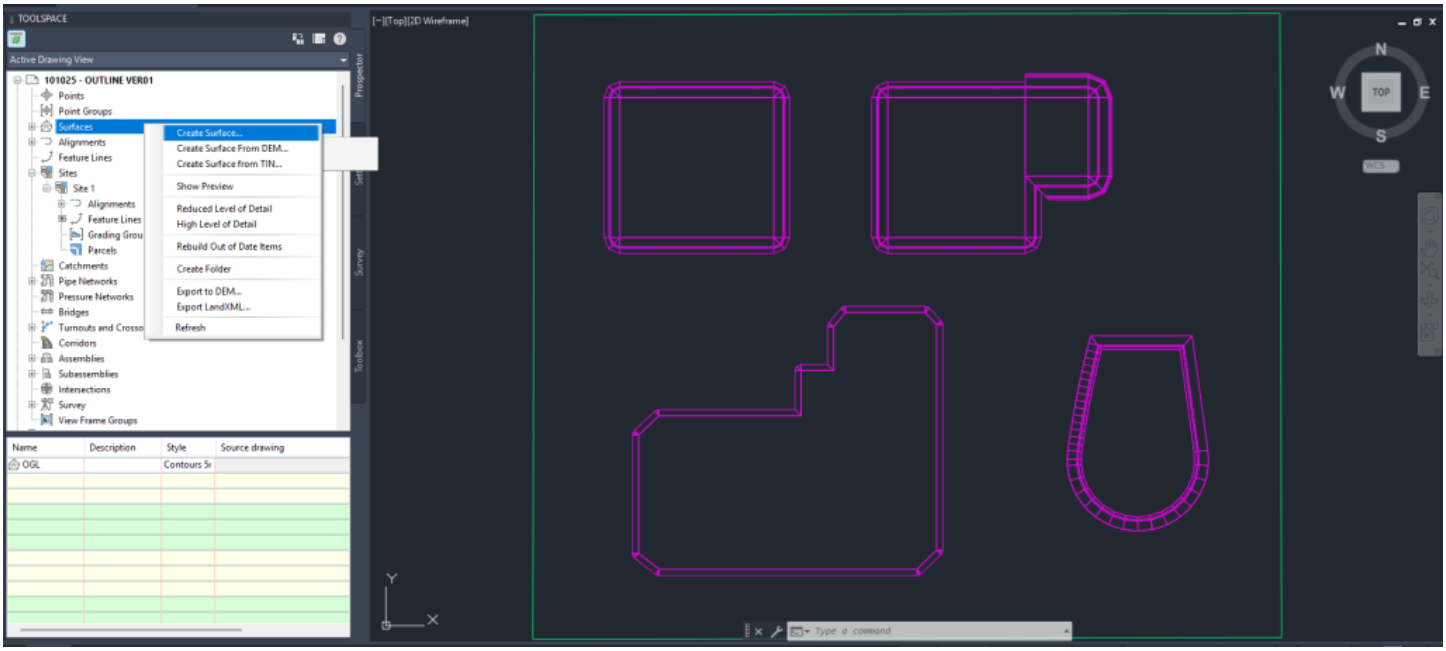
Adding Breaklines to the TIN Surface created

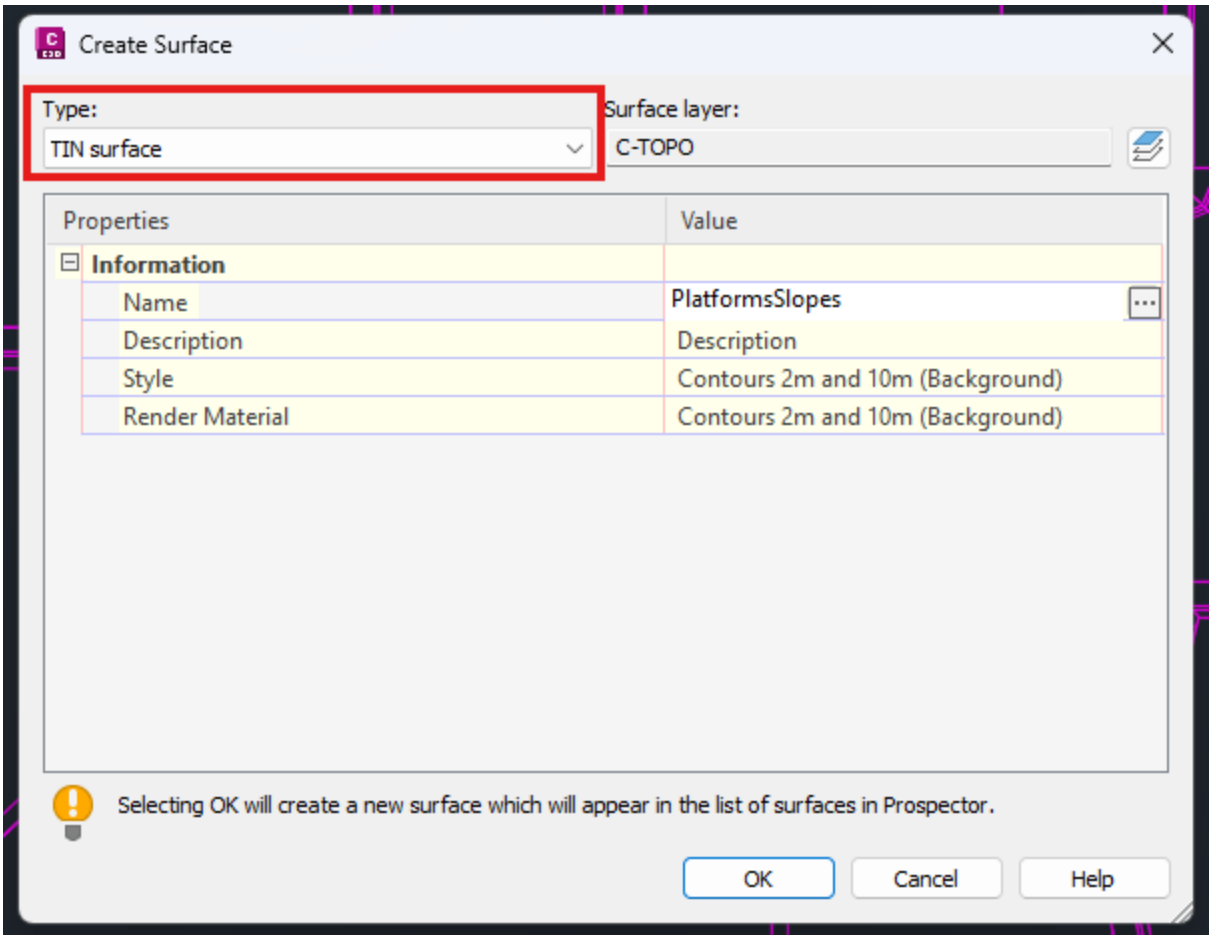
Create a TIN Surface for the platforms and slopes

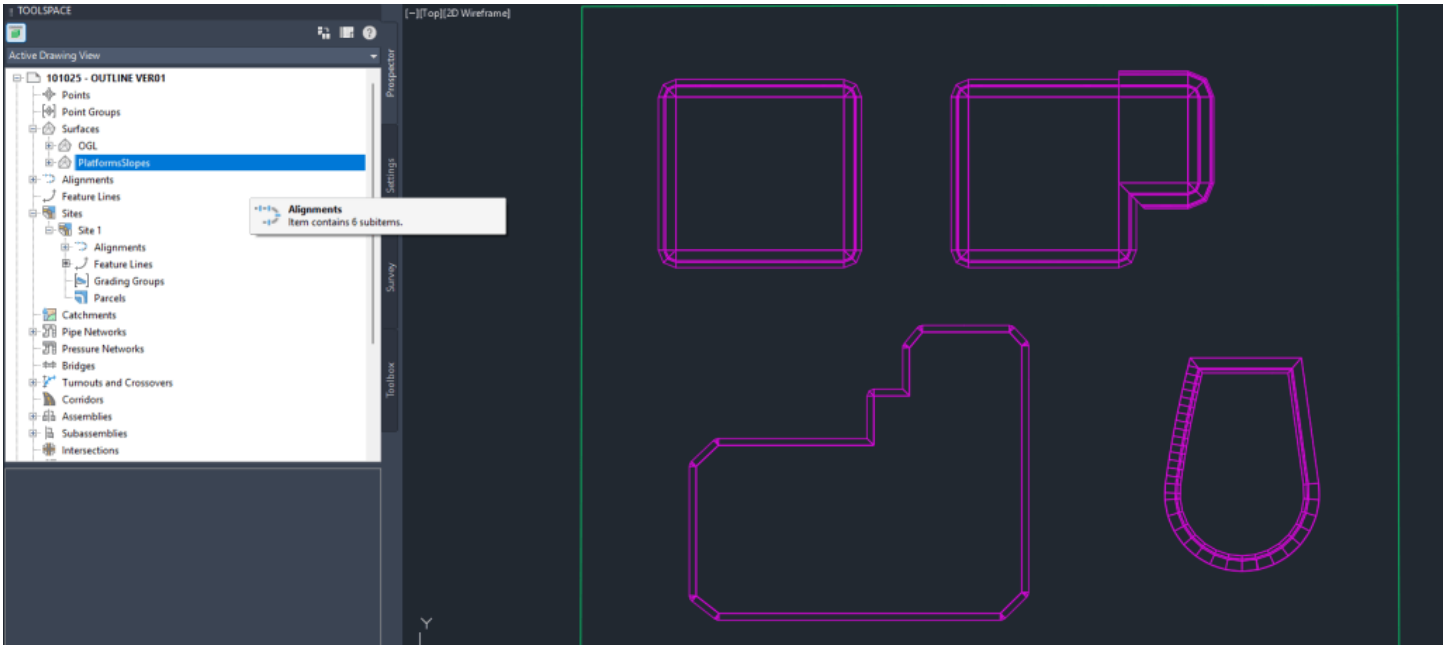
1. Go to the Toolspace tab > Under the Prospector tab > Click on Surfaces

2. Right-click > Click on Create Surface



3. Set the Type: *TIN surface* > Users may also define their own Name, Description, Style, and Render Material.





Creating Wall Breakline for the platforms, slopes, and berms

Having established the TIN Surface, the next step involves defining the faces of the platforms, berms, and slopes.

To proceed with the definition of the Wall Breakline, *a crucial step for modeling retaining walls or abrupt transitions between surfaces*, users may follow the steps in the section of the article below:

Create Two Different Surface Levels Via Wall Breakline - Creating Breaklines

For a better understanding of applying the concepts above, users may refer to the visual guide provided below:

Typical platforms, slopes, and berms

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Platforms with retaining walls

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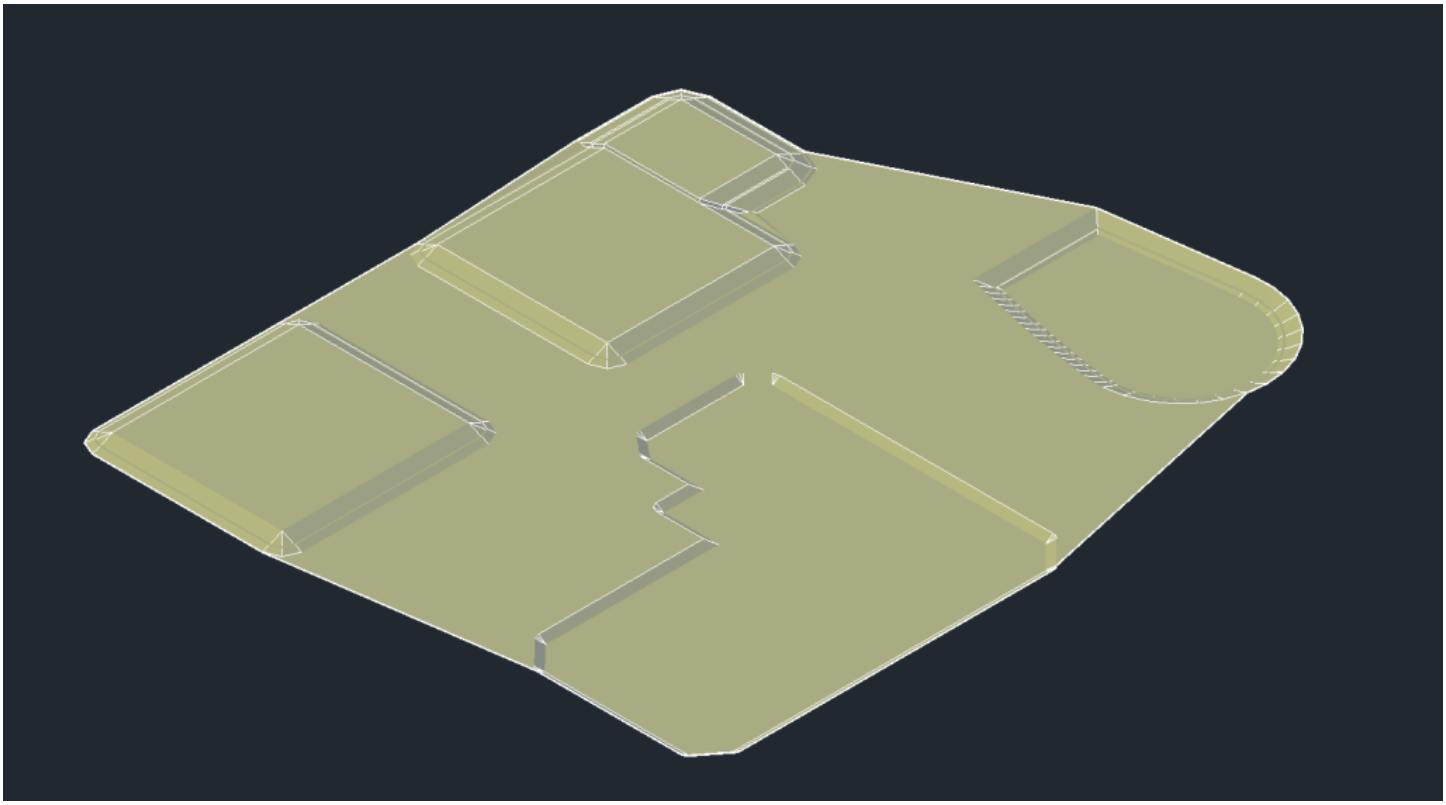


Controlling surface appearance with Boundaries

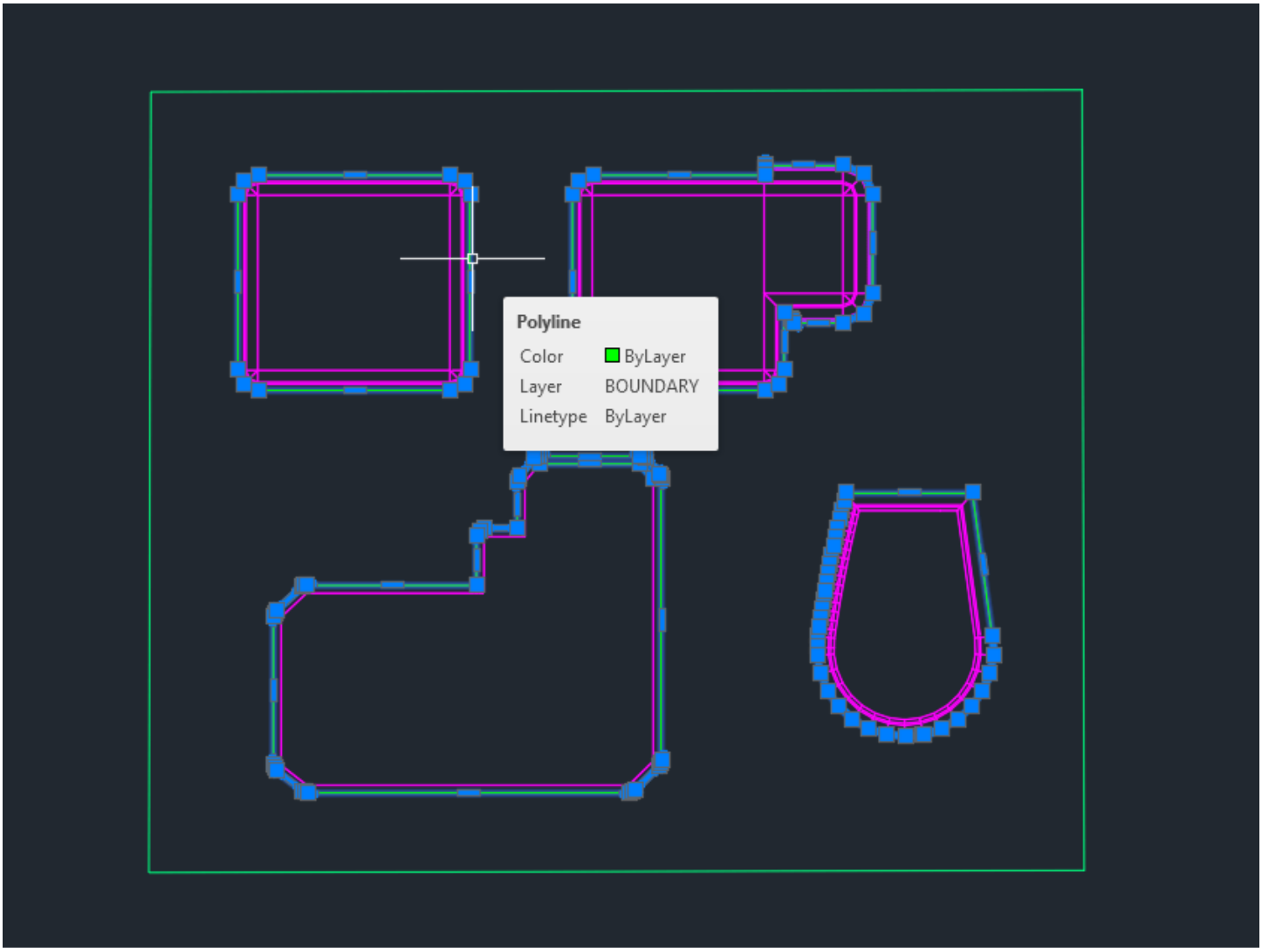
A **Boundary** is a tool within Civil 3D that lets users control the visible area of a TIN Surface. It establishes the boundaries of the surface data, preventing the triangulation algorithm from extending the surface (polymesh) too far and allowing users to hide undesired areas of the surface.

Detailed explanation on the boundary - ***Outer Boundary*** and ***Show Boundary***, which can be applied in our situation from the article, *Boundaries: Controlling the Surface's overall shape*.

Establish the boundary line

Using a polyline, define the boundary of each platform. The boundary should contain the platforms, slopes, and berms.

Therefore, it is advisable to create the polylines at the outermost edge, as in the image below.



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Applying Boundary Type: Outer

By applying the Outer Boundary type, the **inner triangles (face) within the boundary line defined will be visible**, while the outer triangles (beyond the boundary line) will be *hidden*.

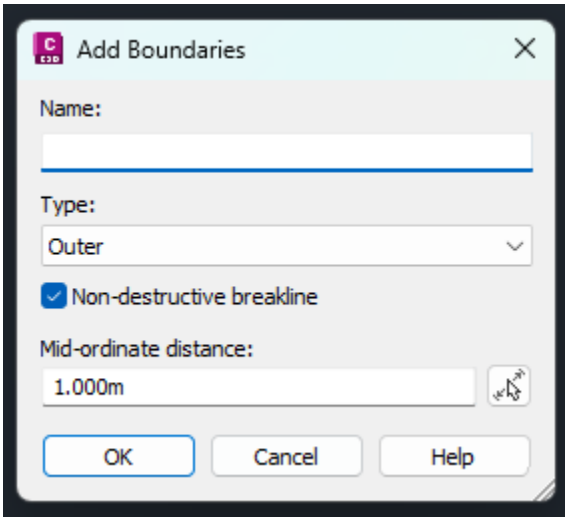
Hence, the surface will only be visible for the desired area, which in this case is the platform area, including the slopes and berms.

Steps:

1. Under the Prospector Tab of the Toolspace, expand Surface > Click on the Defined Surface for the platforms (including slopes and berms).

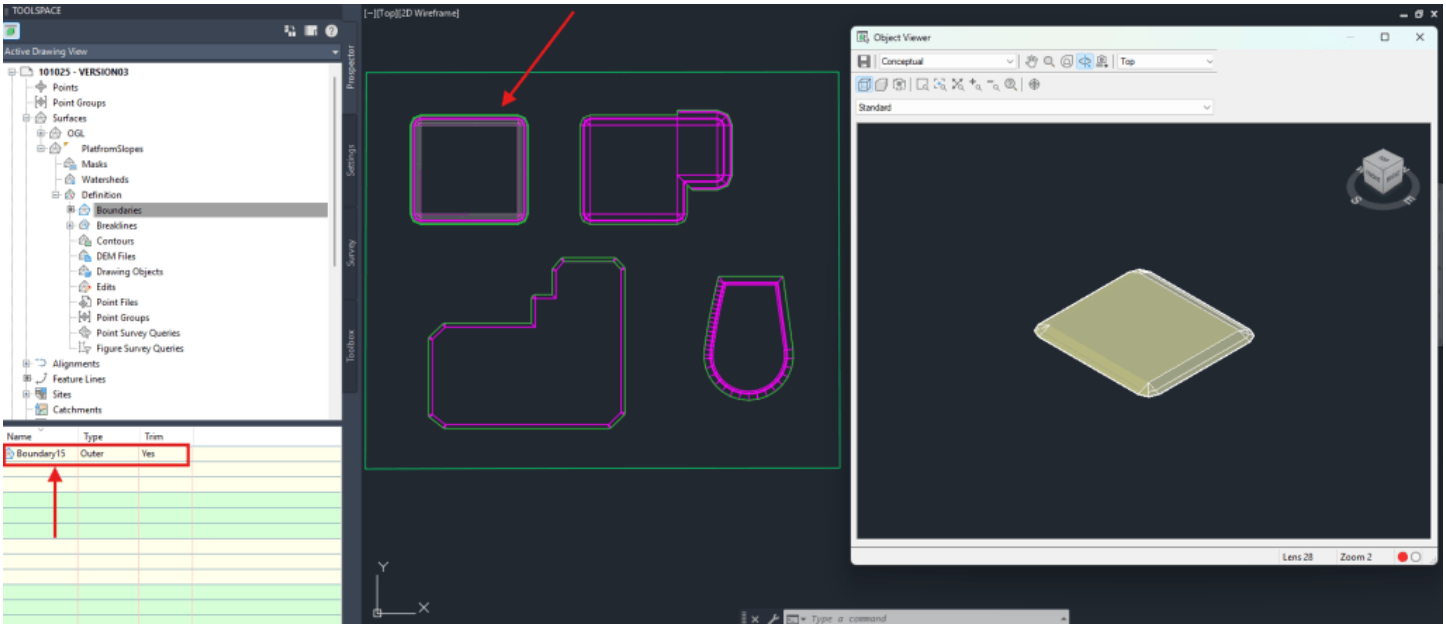
2. Expand the Definition of the surface. Right-click on **Boundaries** and click Add.

3. In the *Add Boundaries* dialog box, enter a Name (optional). Set the **Type** dropdown to **Outer**. Click OK.



4. Users will be prompted to select **Object**. Select any closed polyline that defines the outer boundary of your platform area. Press Enter.

5. The surface will be updated to show only the triangles (faces) that are **inside the selected boundary line**. Any surface outside this limit will be hidden.



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Applying Boundary Type: Show

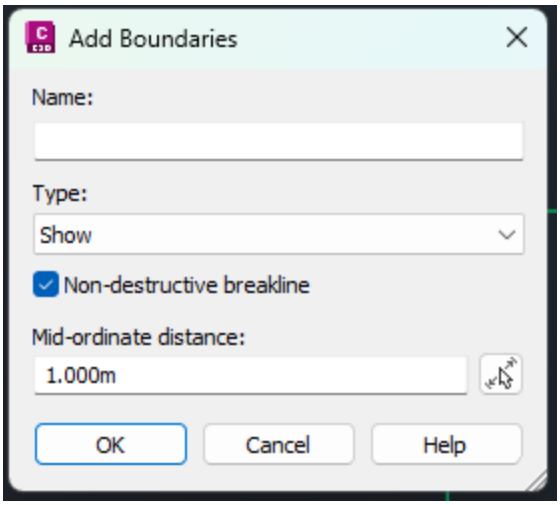
Now, to make the *hidden* triangles (faces) within other platforms' boundary lines reappear or be visible, users can apply the **Show Boundary** type.

Steps:

1. Under the Prospector Tab of the Toolspace, expand Surface > Click on the Defined Surface for the platforms (including slopes and berms).

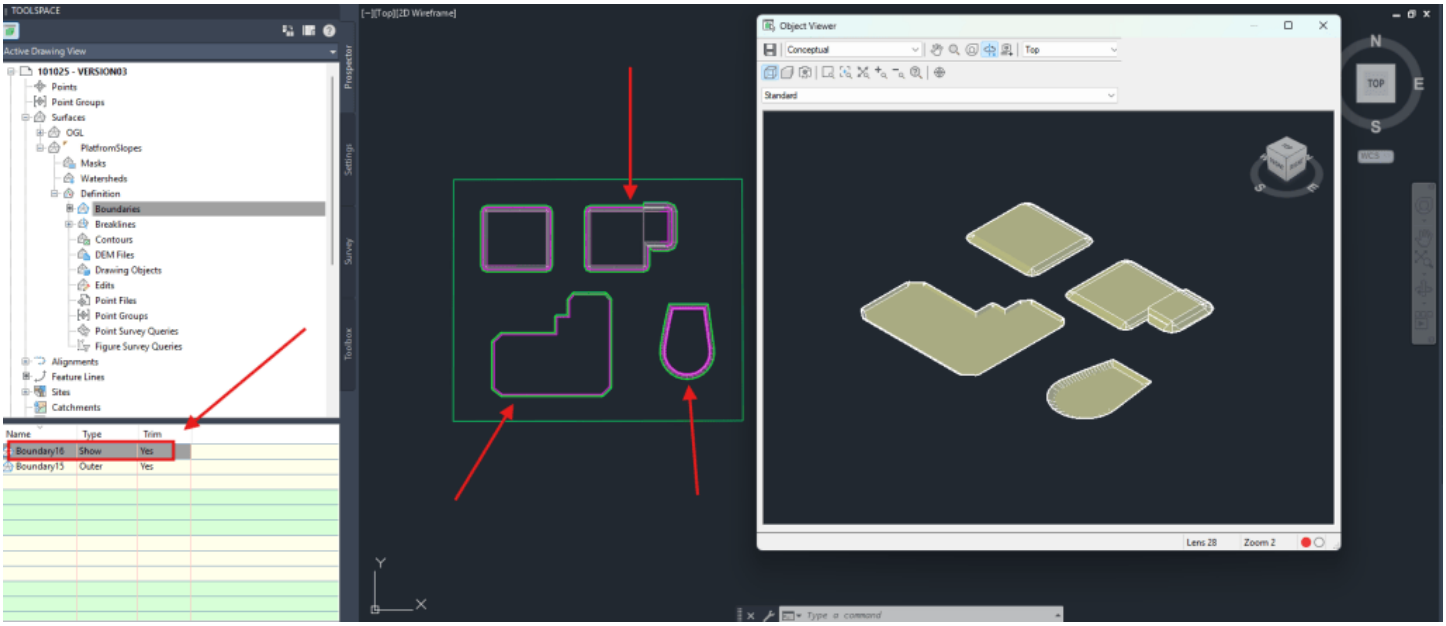
2. Expand the Definition of the surface. Right-click on **Boundaries** and click Add.

3. In the *Add Boundaries* dialog box, enter a Name (optional). Set the **Type** dropdown to **Show**. Click OK.



4. Users will be prompted to select **Object**. Select the other closed polylines that act as the boundary lines of the remaining platforms. Press Enter.

5. The surface will be updated to show the triangles (faces) inside all selected platform boundaries, while continuing to hide the areas outside of the boundaries outlined.



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Conclusion

The steps described above show how the platforms with slopes, berms, and drops can be made in Civil 3D.

However, it is important to understand that when working on *real projects* with lots of platforms, slopes, berms, and various terrain elevations, the process becomes more demanding. As the project complexity rises, so does the amount of work needed to accurately model and represent the terrain features.

For **users of MiTS 3.0 and above**, this labor-intensive task can be simplified and automated by using the **MCIntegrator plugin**. This effective tool optimizes the entire flow, where all the demanding work of defining feature lines, breaklines, and boundaries is transformed into uncomplicated parameter definitions of **surface sync within the plugin**. The plugin will perform the intricate Civil 3D surface polymeshes internally, allowing users to save time and prioritize design optimization over repetitive modeling efforts.

Related articles:

- **Platform Sync in MCIntegrator: The Explanation and Benchmark**
- **How to Modify Synced Surface Styles?**

Related



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I'm the Benevolent Dictator for Life for MiTS Software cum Editor of this website. Read more here.

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