CES463477-L

Building 1 Kilometer of City Street in AutoCAD Civil 3D for 90 Minutes

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Learning Objectives

- Learn how to build a basic corridor for city street
- Learn how to build road junctions
- Learn how to build turnaround intersections
- Learn how to export corridor to solids which will be used later in BIM-model
- Learn how to enrich BIM-model with important data

Description

City street designing is an important and very complex task, which includes many challenges and problems. In this lab we will learn how to deal with most of them with flexible tools of AutoCAD Civil 3D. And even such serious tasks as building turnaround intersections and road junctions will become understandable and doable.

Speaker

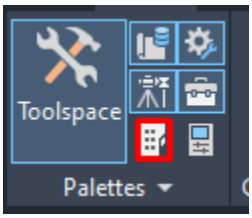
I've been working in Civil 3D for more than 14 years, and as an instructor, I've trained more than 1200 specialists. Working on many different projects and facing various challenges, I've come up with the conclusion that there is nothing impossible for Civil 3D. And yet there is always some space for growth and development.

City street designing is one of my favorite tasks. Let me show you why :)

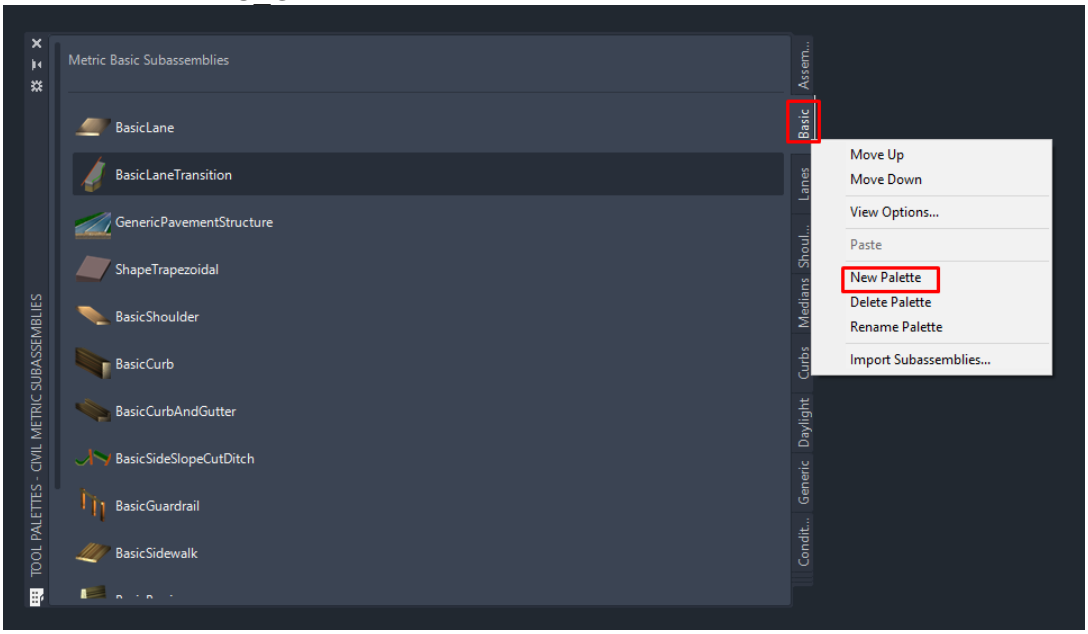
Exercise0. Importing subassemblies.

In this lab we will use pre-built subassemblies which were made is Subassembly Composer. For our assemblies to work right, we need to import them into Tool palette.

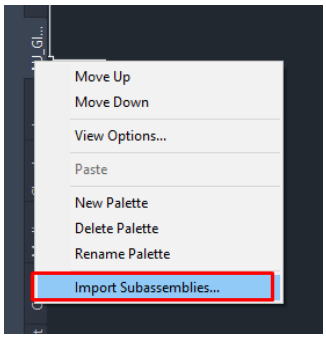
1. Opern the drawing Exc0_Importing Subassemblies.dwg
2. Go to Ribbon => Tool palette.



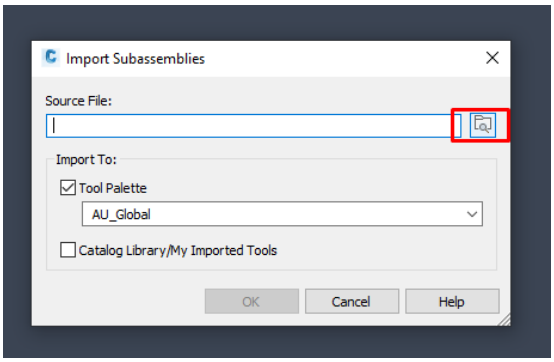
3. Rightclick with your mouse button on any palette and select "New palette" command and name it “AU_Global”.

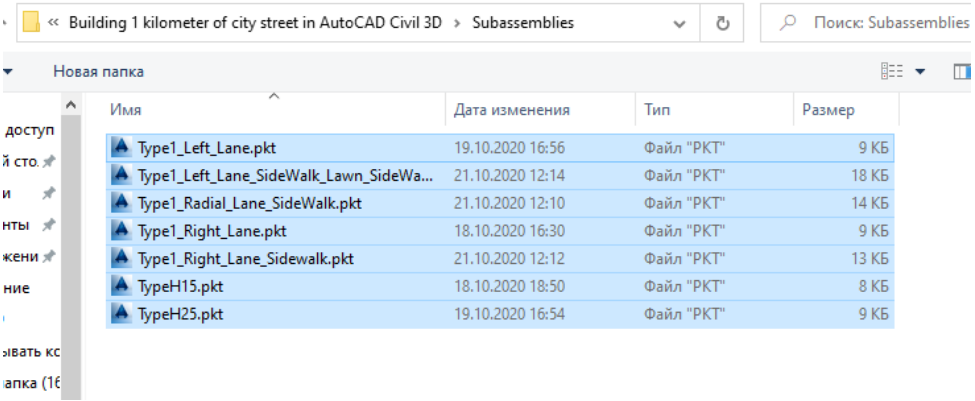


4. Rightclick with your mouse button on the “AU_Global” palette and select “Import Subassemblies”.

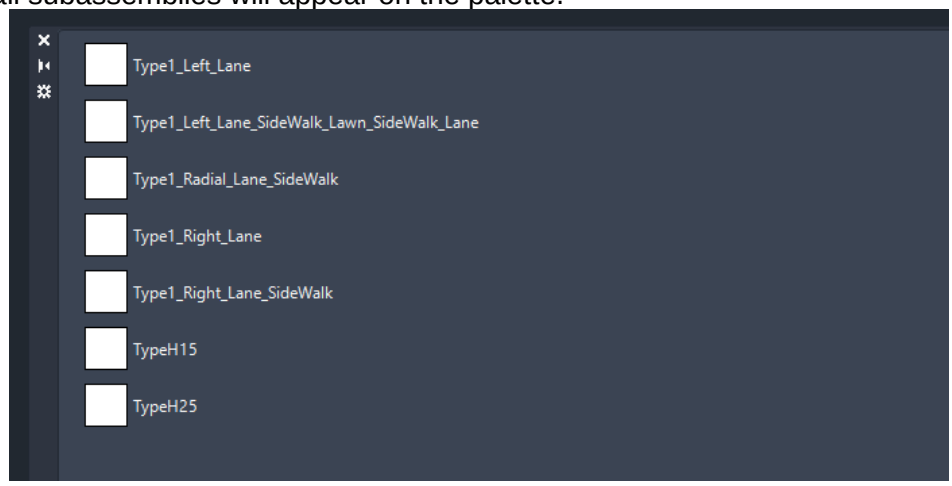


5. Select all files from the “Subassemblies” folder and then press the “OK” button.





After that, all subassemblies will appear on the palette.

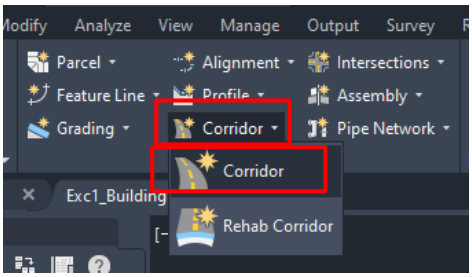


6. Close Civil 3D and launch it again.

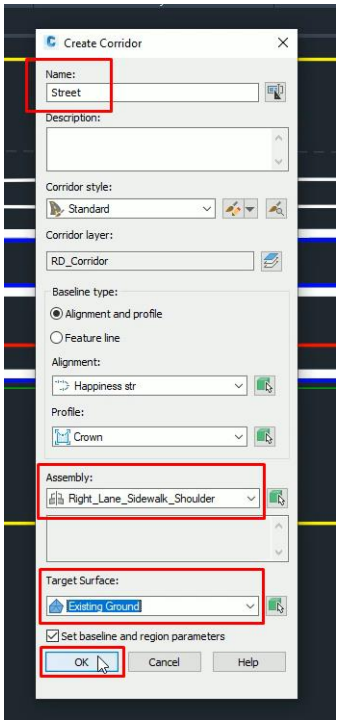
Exercise1. Building corridor.

All big projects start with simple steps. Let's make our corridor.

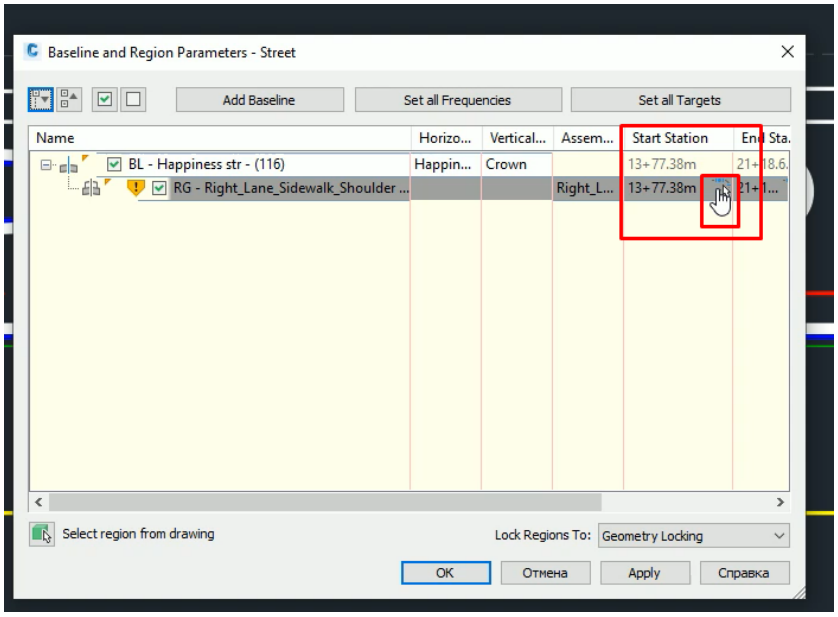
1. Open the drawing Exc1_Building corridor.dwg
2. Go to Ribbon=>Corridor=>Corridor.



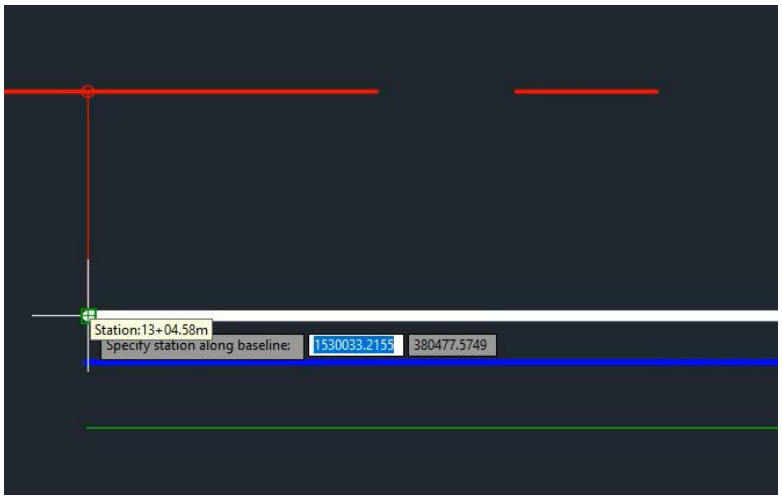
3. Name=Street
Assembly=Right_Lane_SideWalk_Shoulder
Target Surface=Existinng Ground.
OK.



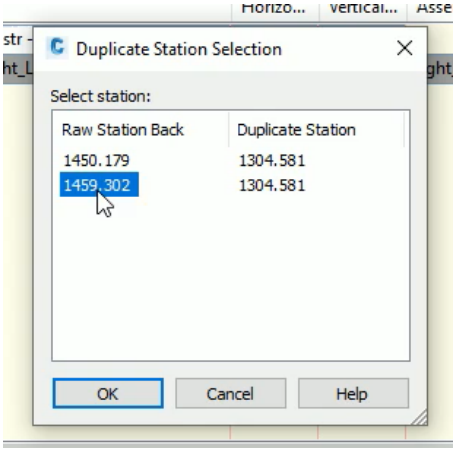
4. Adjust the Start station by clicking on the station icon.



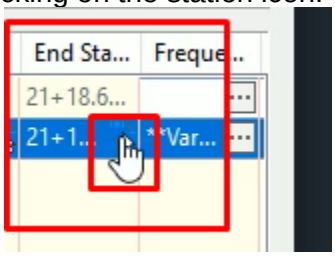
Select the first point of the lane edge.



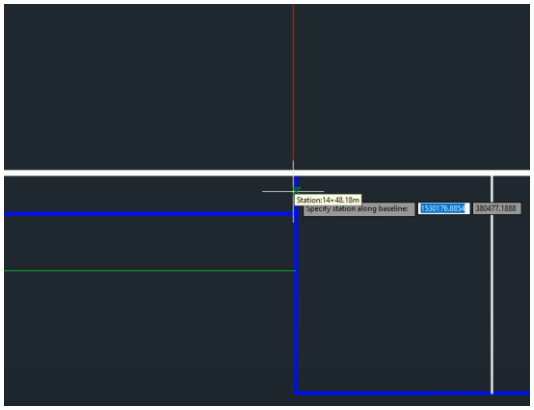
5. In the “Duplicate Station Selection” window select the second line.



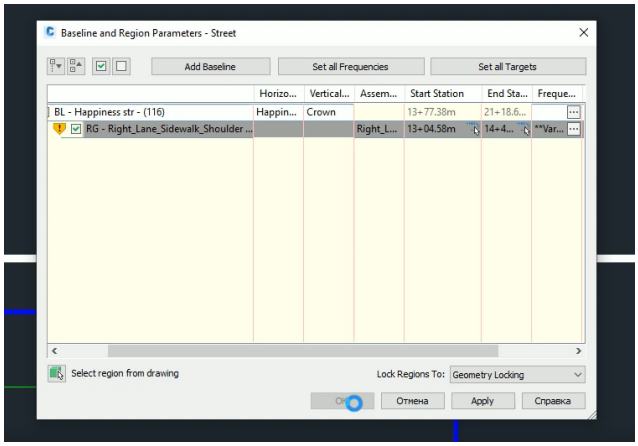
6. Adjust the End station by clicking on the station icon.



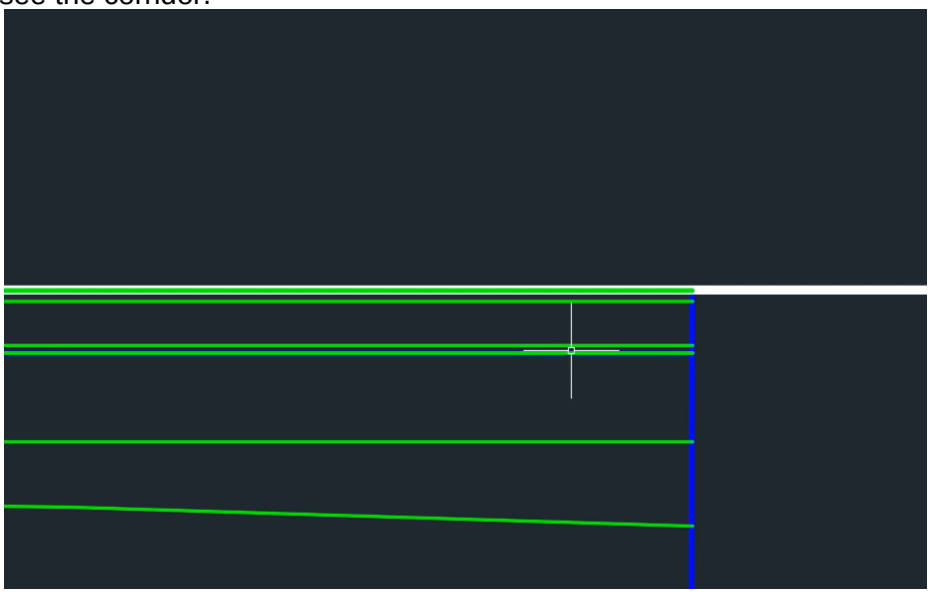
Select the first line of the bus station.



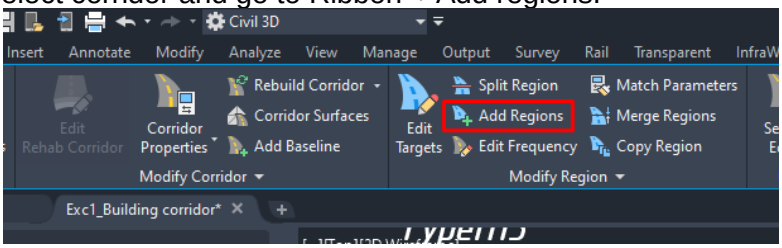
Press the “OK” button.



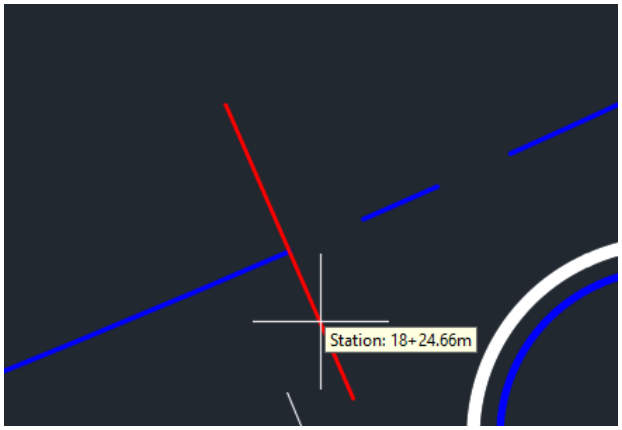
7. You will see the corridor.



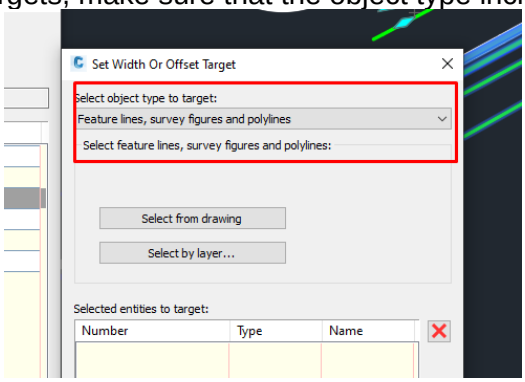
8. Our corridor and its first region are done, and now we need to add 10 more regions. To add a region select corridor and go to Ribbon=>Add regions.



Make sure that each following region starts with the end of the previous region. While adding regions, pay attention to the station mark:

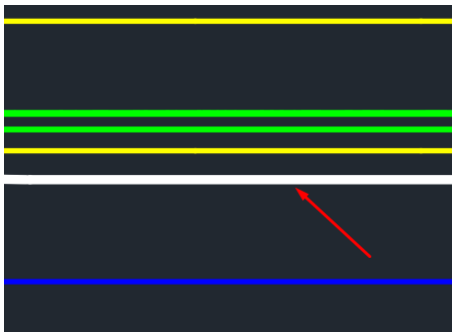


While selecting offset targets, make sure that the object type includes polylines.

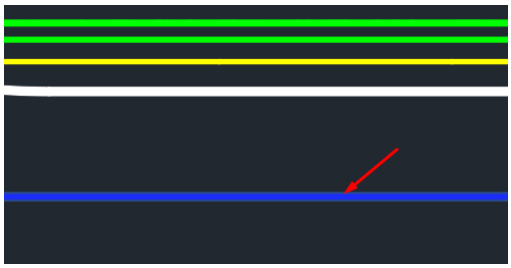


9. Some regions will require adjusting targets and some not. Here is a list of all adjustments you need to make for these regions.

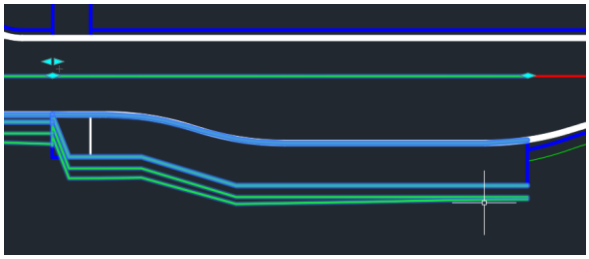
Region#1.
Start station=14+48.24
End station=14+98.25
Assembly=Right_Lane_SideWalk_Shoulder
Target surface=Existing ground
Lane offset=Polyline



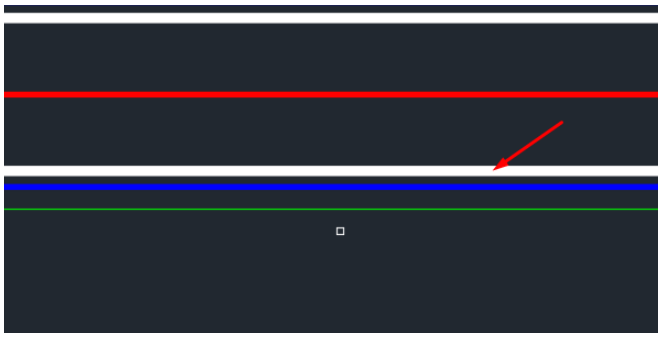
Sidewalk offset=Polyline



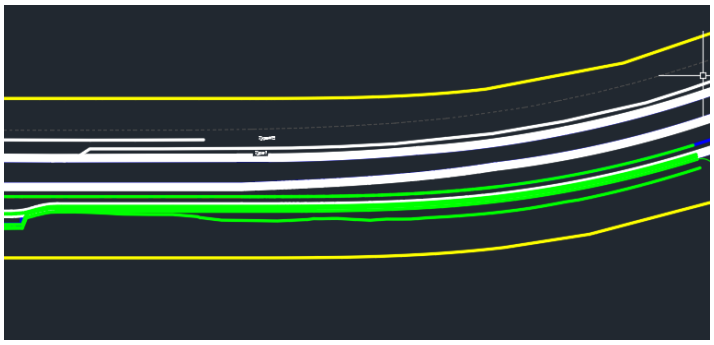
Result:



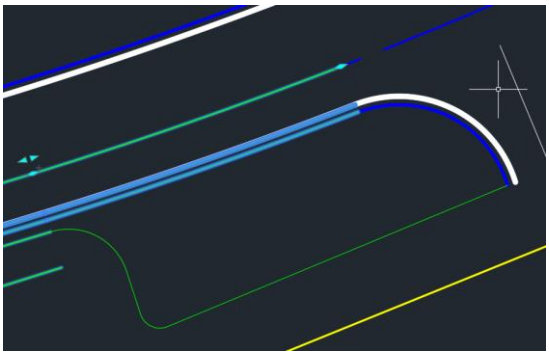
Region#2
Start station=14+98.25
End station=17+75.42
Assembly= Right_Lane_SideWalk_Shoulder
Target surface=Existing ground
Lane offset=Polyline



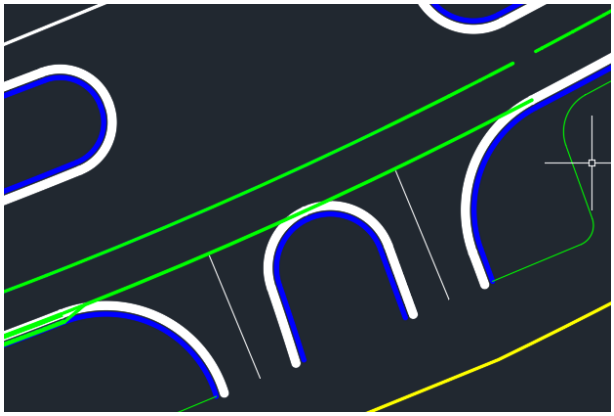
SideWalk offset=None
Result:



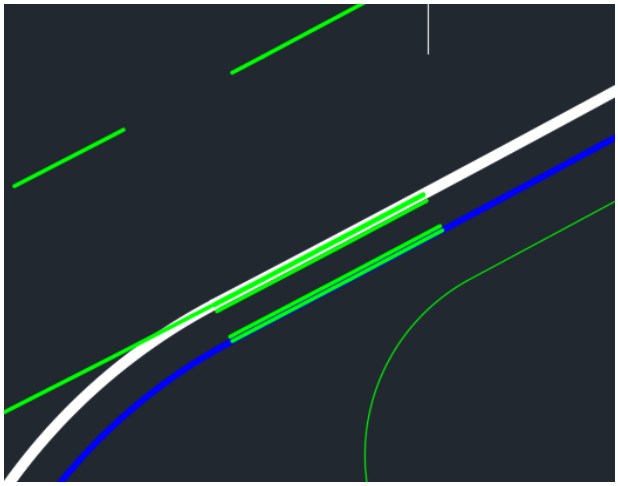
Region#3.
Start station=17+75.42
End station=18+07.57
Assembly= Right_Lane_SideWalk
Target surface=Existing ground
Lane offset=None
SideWalk offset=None
Result:



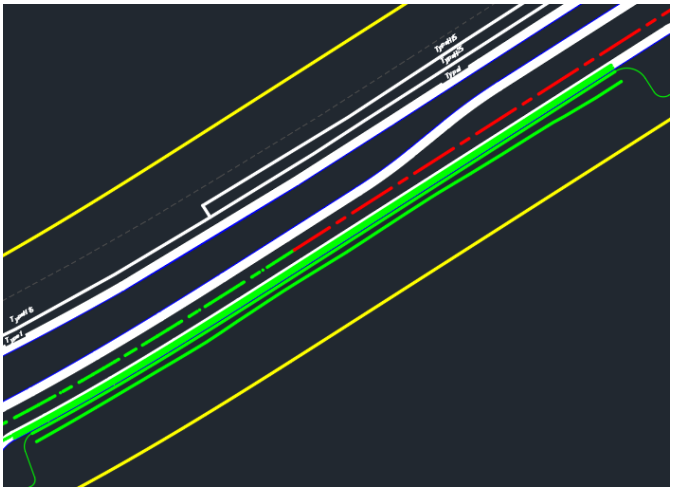
Region#4.
Start station=18+07.57
End station=18+57.28
Assembly= Right_Lane
Target surface= None
Lane offset=None
SideWalk offset=None
Result:



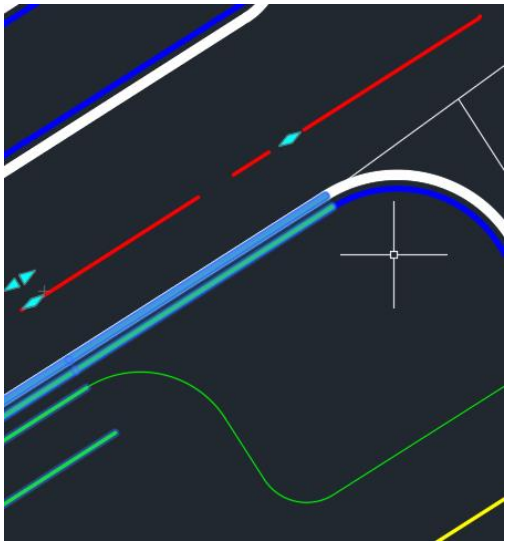
Region#5.
Start station=18+57.28
End station=18+62.07
Assembly= Right_Lane_SideWalk
Target surface= None
Lane offset=None
SideWalk offset=None
Result:



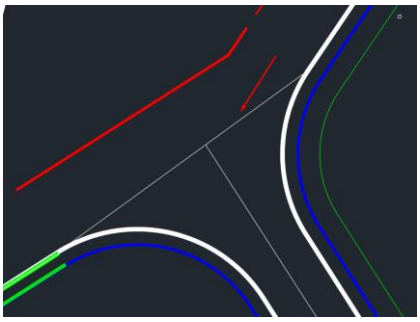
Region#6.
Start station=18+62.07
End station=20+48.10
Assembly= Right_Lane_SideWalk_Shoulder
Target surface= Existing ground
Lane offset=None
SideWalk offset=None
Result:



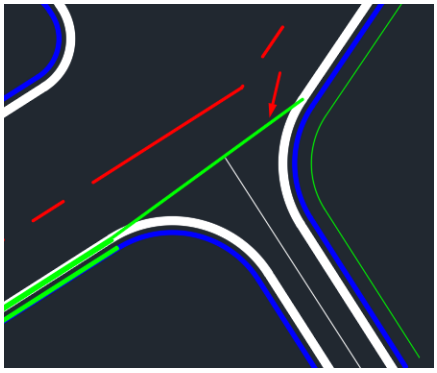
Region#7.
Start station=20+48.10
End station=20+66.26
Assembly= Right_Lane_SideWalk
Target surface= None
Lane offset=None
SideWalk offset=None
Result:



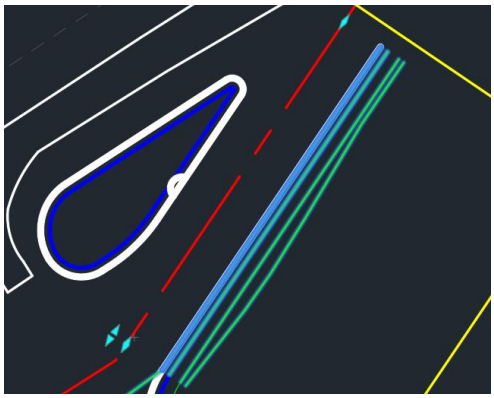
Region#8.
Start station=20+66.26
End station=20+81.40
Assembly= Right_Lane
Target surface= None
Lane offset=Polyline



SideWalk offset=None
Result:



Region#9.
Start station=20+81.40
End station=21+16.68
Assembly= Right_Lane_SideWalk_Shoulder
Target surface= Existing ground
Lane offset=None
SideWalk offset=None

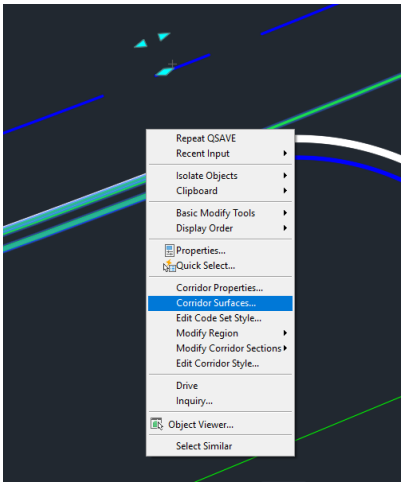


Exercise2. Road junctions.

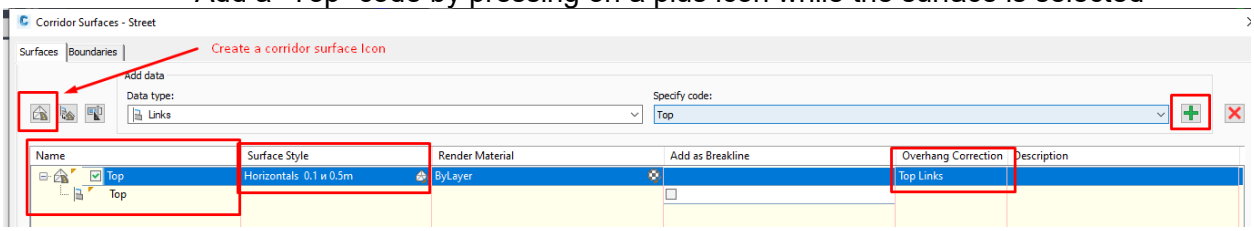
In this exercise, we are going to obtain one of the most important skills for street designing – road junctions. This skill consists of working with feature lines, regions, and adjusting offset and elevation targets.

At first steps, it may seem to be hard and complex, but after a little bit of practice, you will understand that it is quite a simple and consistent task.

1. Open the drawing Exc2_Road junctions.
2. Select corridor, then right-click with the mouse button and select **Corridor Surfaces**.

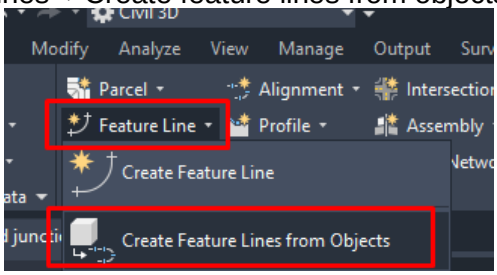


3. Press on a “Create a corridor surface icon” to create a surface.
   Then, make the following adjustments:
   - Name=Top
   - Surface style= Horizontals 0.1 and 0.5m
   - Overhang Correction= Top links
   - Add a “Top” code by pressing on a plus icon while the surface is selected

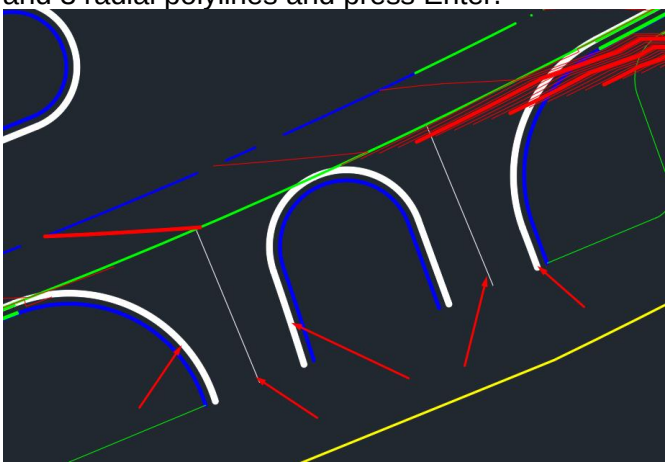


Press the “OK” button.

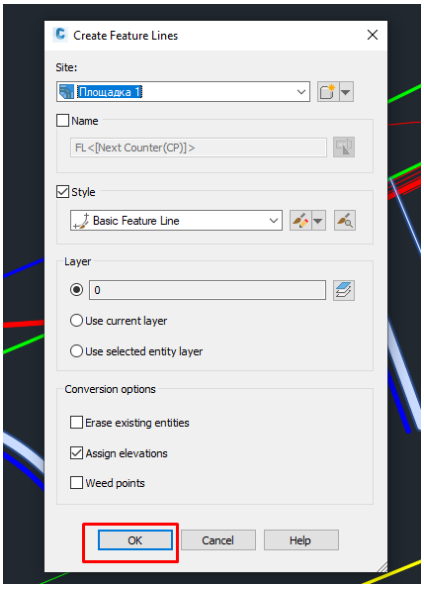
4. Go to Ribbon=>Feature lines=>Create feature lines from objects

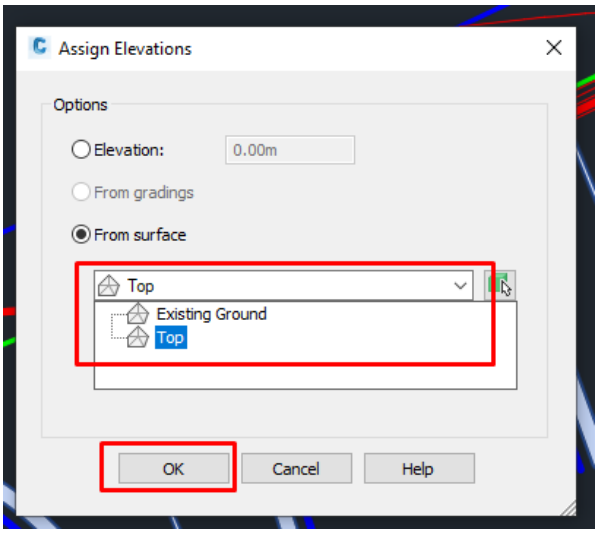


Then select 2 axis and 3 radial polylines and press Enter.



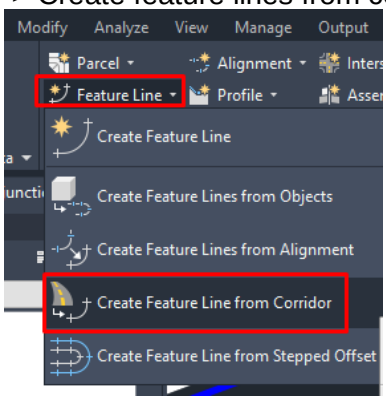
In the “Create feature lines” window press the “OK” button. In the “Assign Elevations” window select the “Top” surface and press the “OK” button.



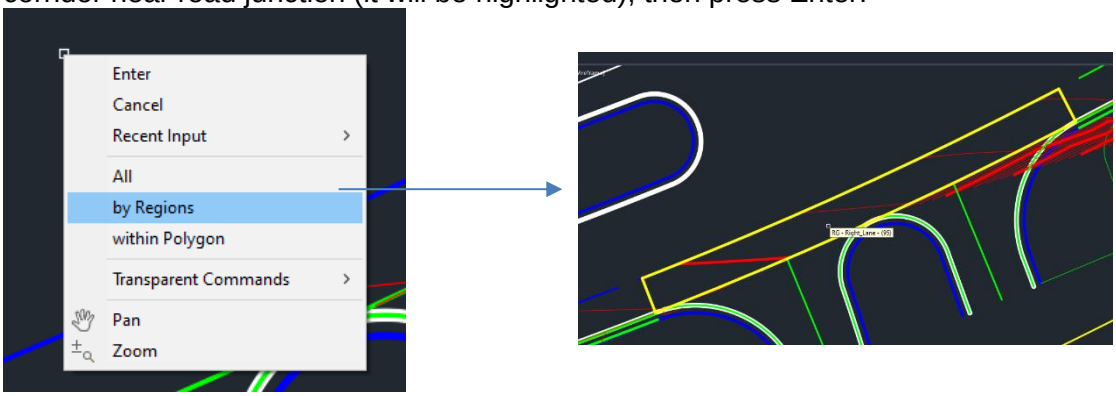


And here are our five feature lines.

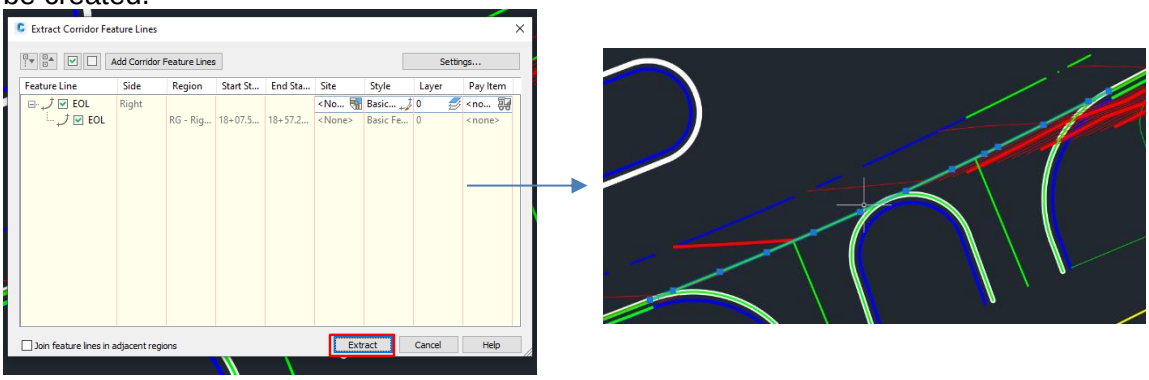
5. Go to Ribbon=>Feature lines=> Create feature lines from corridor.



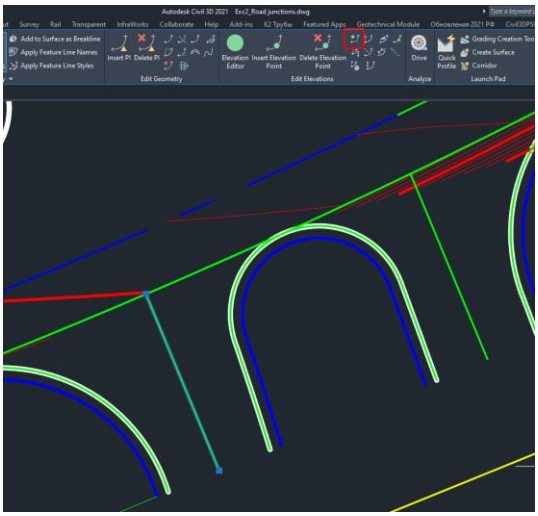
Right-click with the mouse button and select “By regions” and select region of the corridor near road junction (it will be highlighted), then press Enter.



In the “Extract Corridor Feature lines” press the “Extract” button, and a feature line will be created.

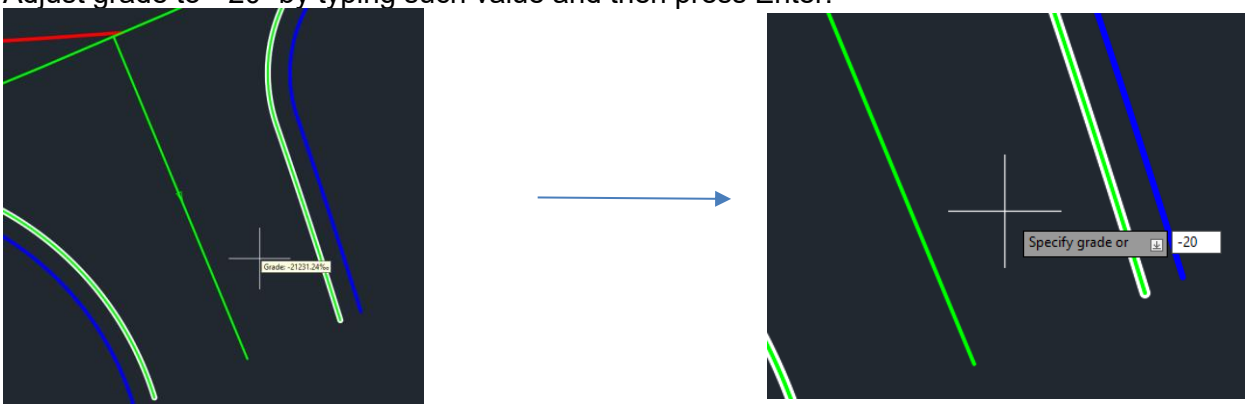


6. Select the first axis feature line and go to Ribbon, where you need to press the “Quick elevation edit” command icon.

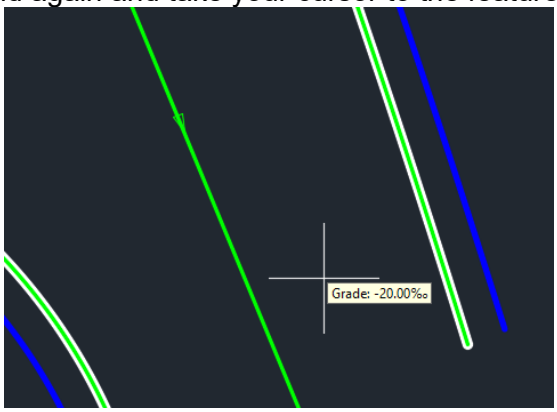


7. Take your cursor near the end of the axis (the begining of the axis is near the corridor) and left-click with the mouse button.

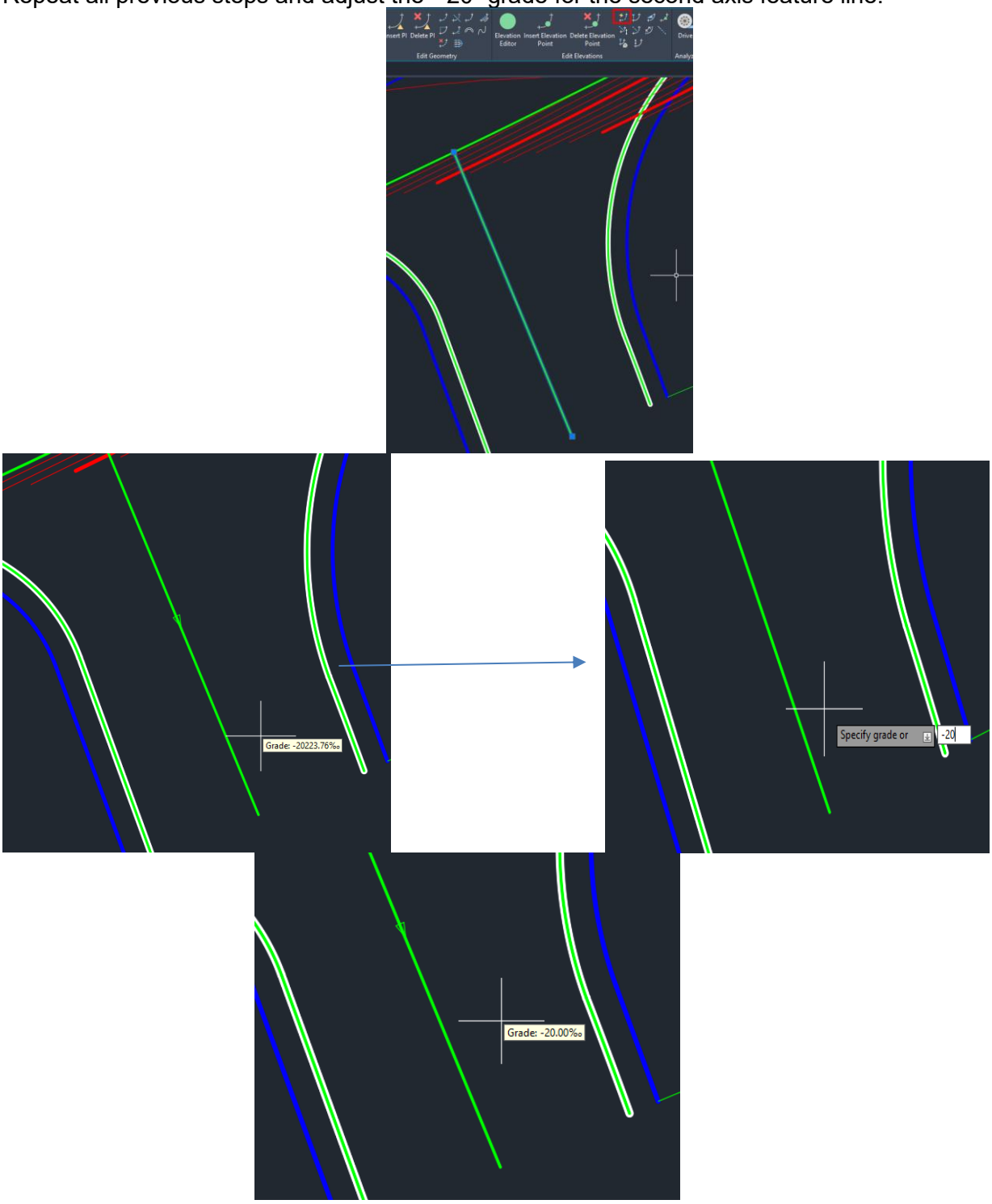
Adjust grade to “-20” by typing such value and then press Enter.



Make sure that now the grade value for this axis is -20. To do that, launch the “quick elevation edit” command again and take your cursor to the feature line.

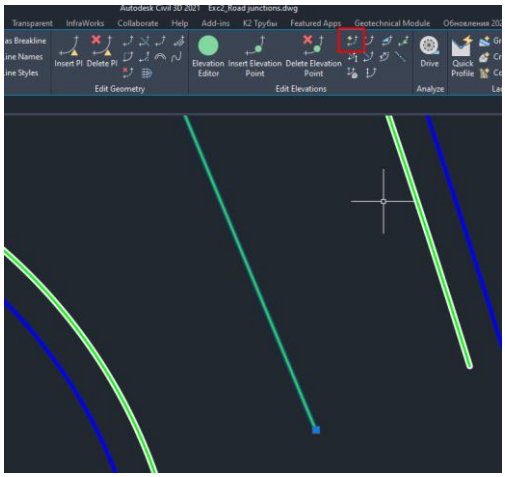


8. Repeat all previous steps and adjust the “-20” grade for the second axis feature line.

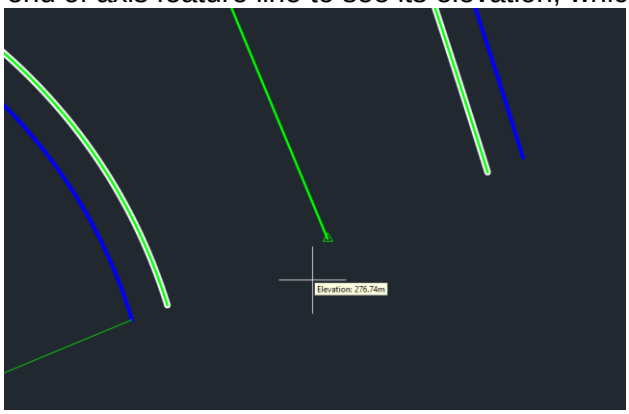


9. Now, using the command “Quick elevation edit” we will adjust elevations for radial feature lines.

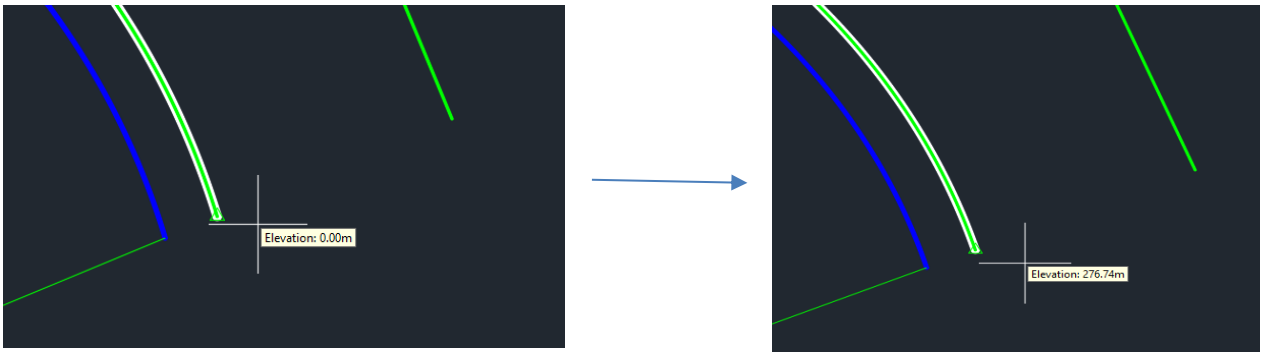
Select any feature line and on the Ribbon press the “Quick elevation edit” icon.



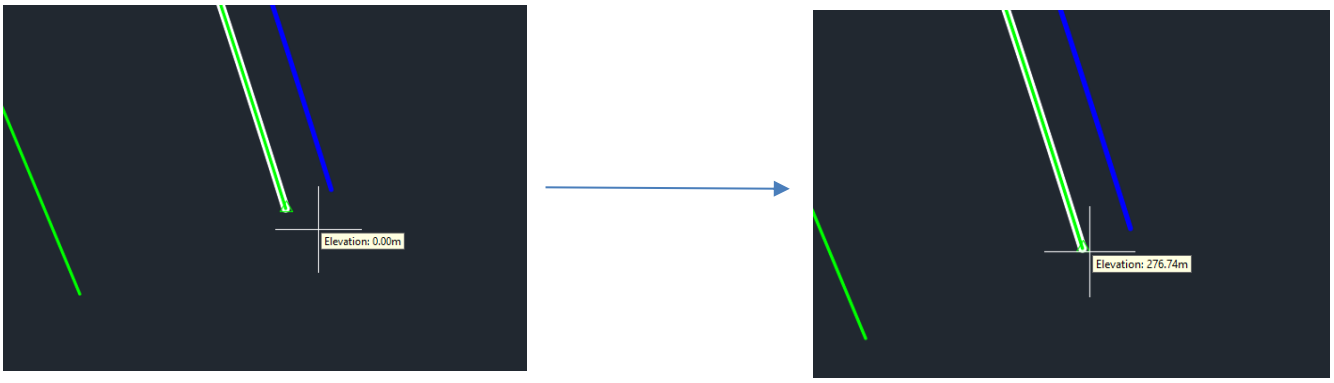
Move the cursor the end of axis feature line to see its elevation, which is 276.74.



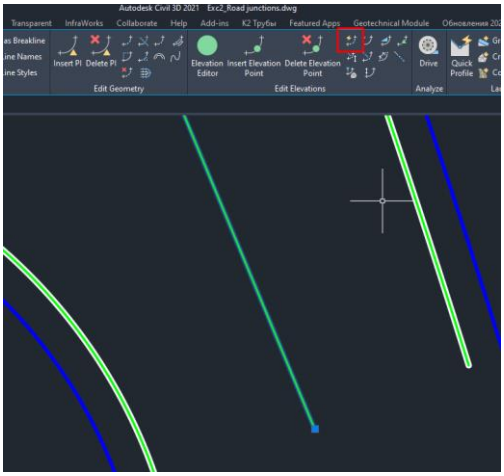
Move the cursour to the end of the radial feature line and adjust its elevation from 0 to 276.74 by left-clicking with the mouse button and typing “276.74”.



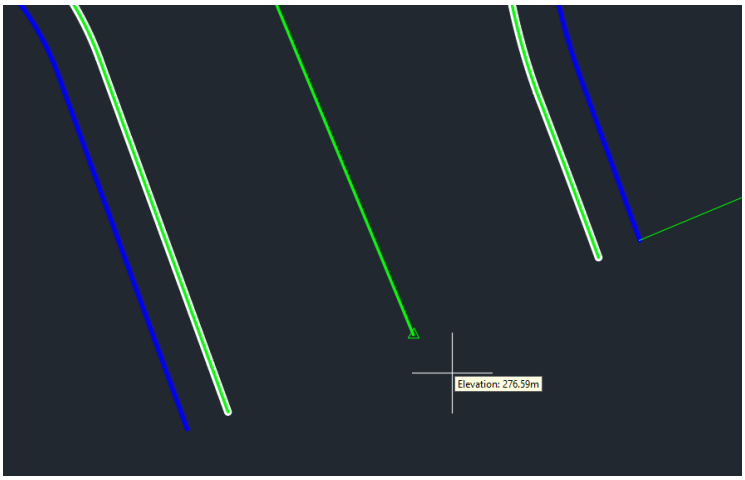
Repeat these steps to adjust the elevation for the elevation for the second feature line.

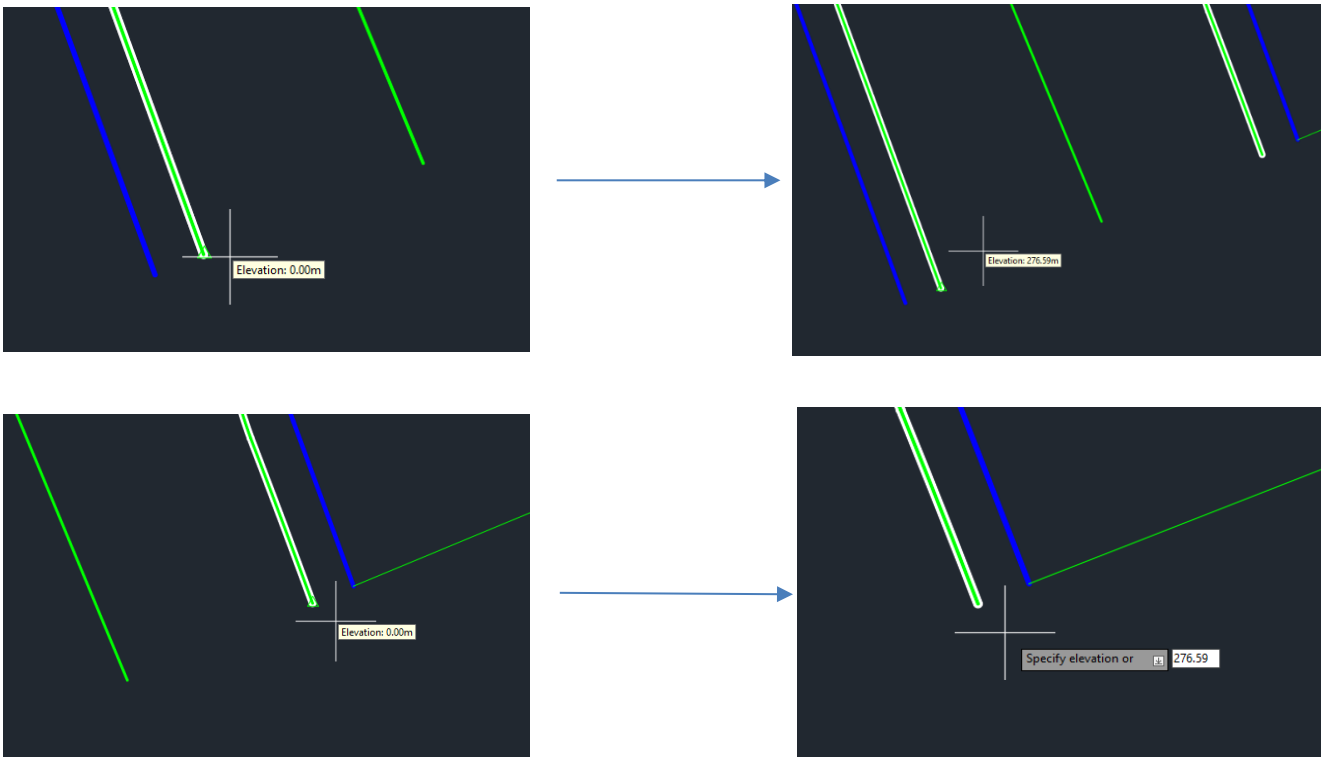


10. Now, we need to deal with two vertexes near the second axis feature line. And we also are going to use the “Quick elevation edit” command.

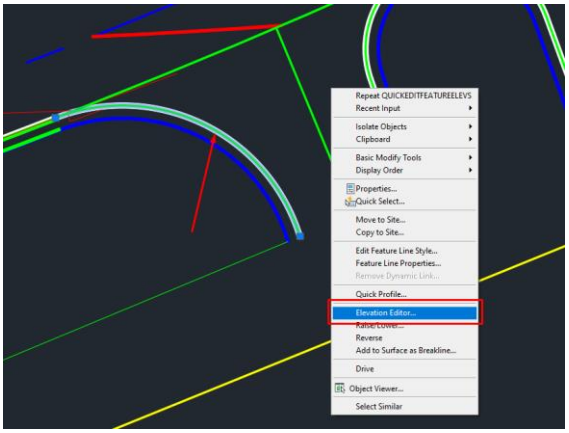


The elevation of the second axis feature line vertex is 276.59.

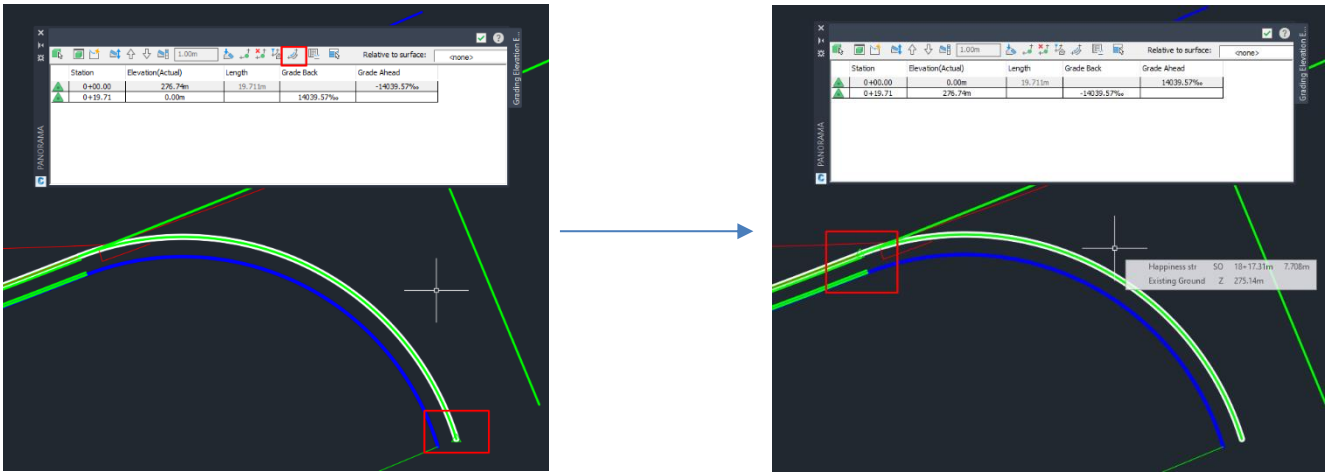




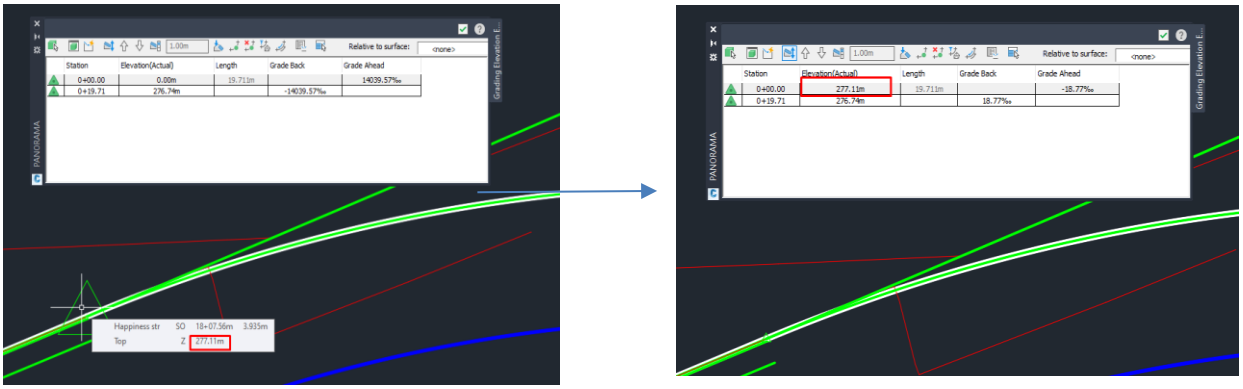
11. Select the first radial feature line, then right-click with the mouse button and select the “Elevation editor” command.



Our first vertex needs to be near the edge of the main driveway. Select the first vertex in the Elevation editor and, as you can see, it is not. Press on the “Reverse the direction” icon to fix that.

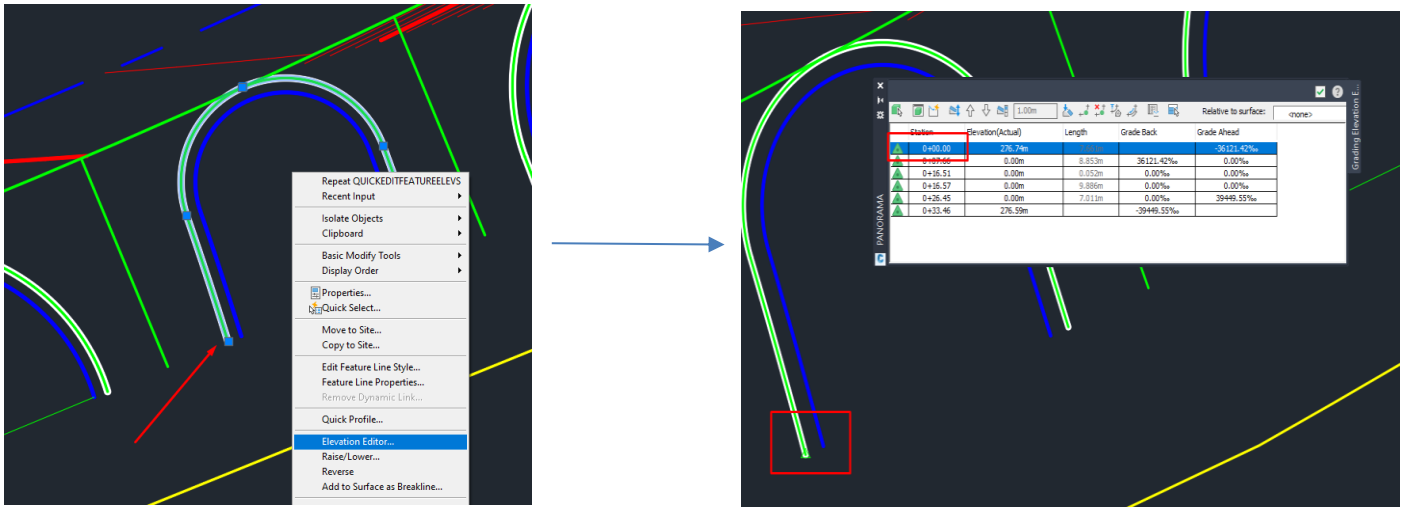


Then, move your cursor at the driveway just a little bit aside from our radial feature line and check the elevation of the “Top” surface. It is 277.11. Input this value for our vertex in the elevation editor.

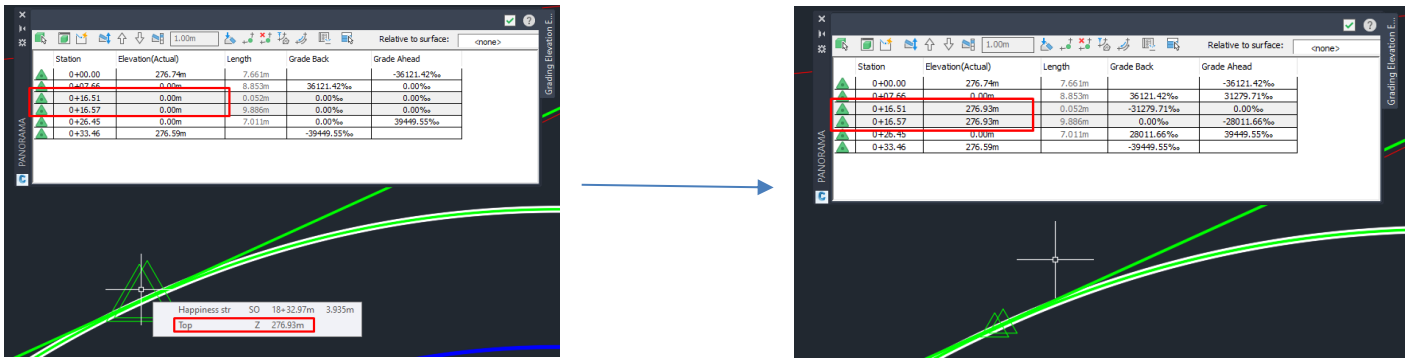


12. Dealing with the second radial feature line is a bit different since it has more vertexes, but uses the same command.

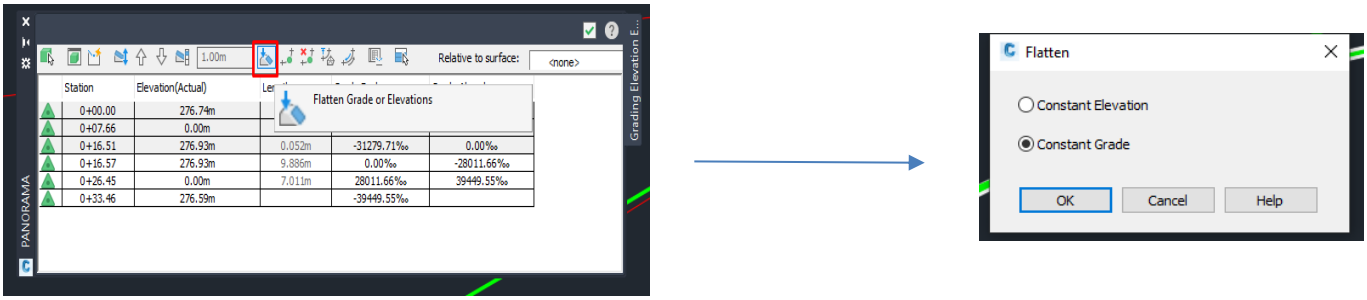
Select the second radial feature line, then right-click with the mouse button and select the “Elevation editor” command.
Select the first vertex in the elevation editor, is it starts near the end of the axis feature line – it is correct. If it is not – Reverse the direction.



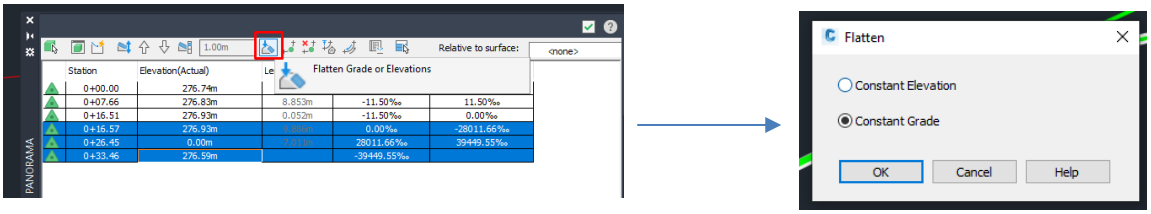
Select the third and fourth vertexes. Then check the appropriate elevations of the “Top” surface near them by leaving the cursor on the main driveway.
Input this elevation, which is 276.93, in the elevation column for our vertexes.



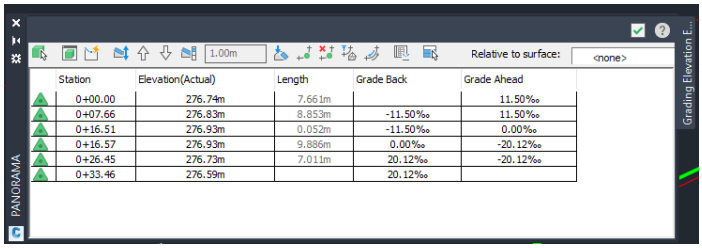
Select the first, second, and third vertexes. Press the “Flatten grade or elevations” command icon. Select the “Constant grade” option.



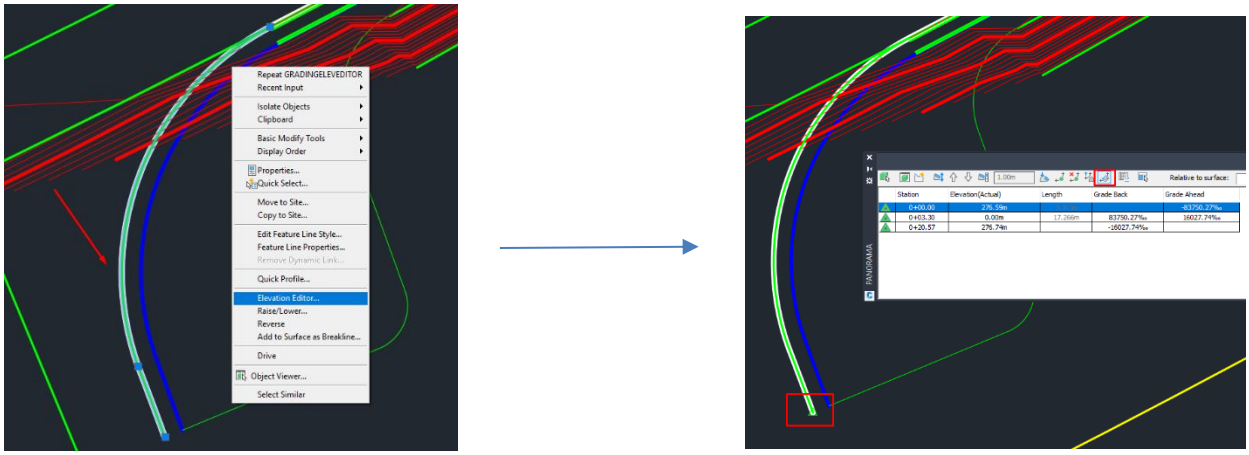
Repeat this action for the fourth, fifth, and sixth vertexes.



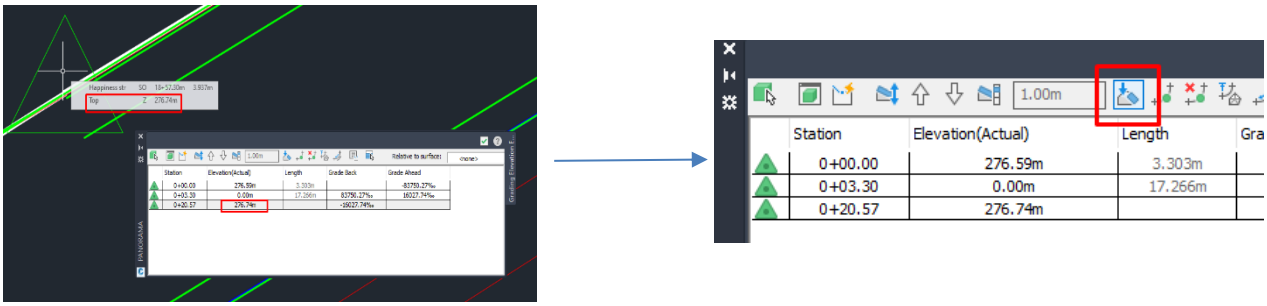
As a result, now, we have all vertexes with the correct elevations.



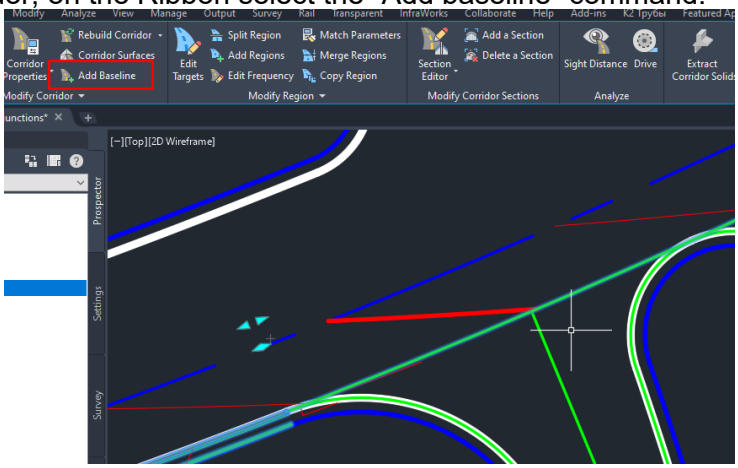
13. Select the third radial feature line, then right-click with the mouse button and select the “Elevation editor” command. The first vertex should be near the end of the axis feature line. Use the “Reverse the direction” command if it is not.



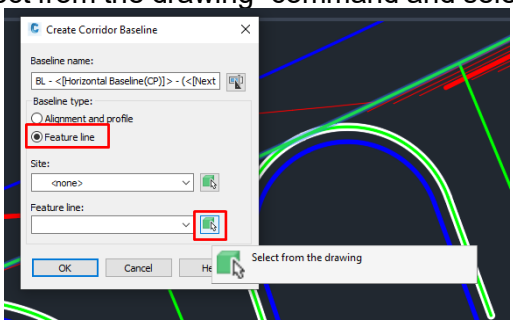
Select the third vertex and check the elevation of the “Top” surface near it. It is supposed to be 276.74/ If it is not – fix it. After that, select all the vertexes and use the “Flatten” command with the “Constant grade” option to fix the second vertex elevation.



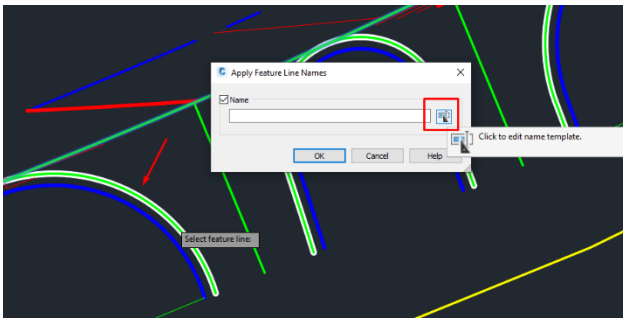
14. Select corridor, on the Ribbon select the “Add baseline” command.

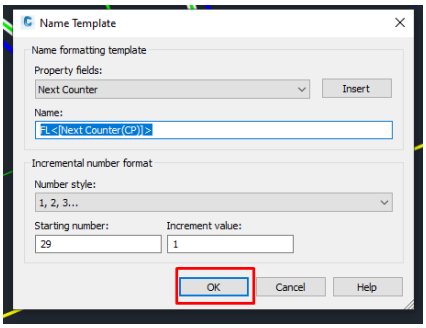


15. In the “Create Corridor Baseline” window select “Feature line” as a baseline type. Then, press the “Select from the drawing” command and select our first radial feature line.

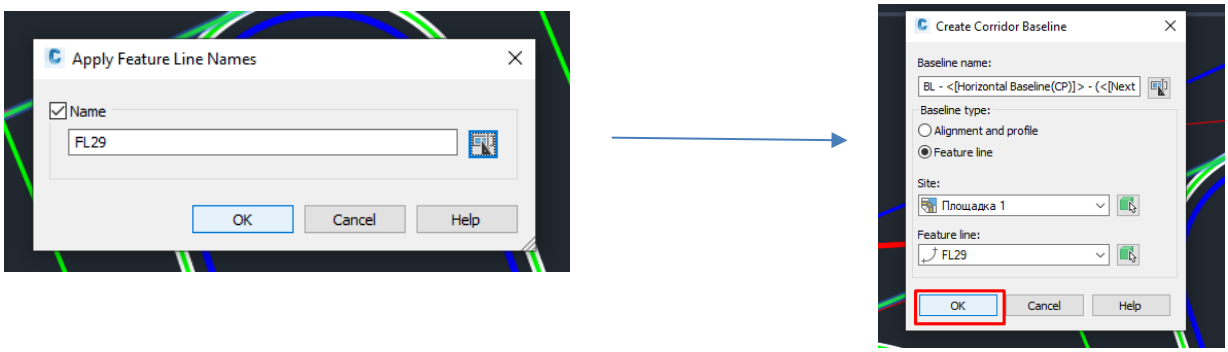


After the selection of the feature line, in the “Apply Feature Line Names” window press on the name template icon. Do not do anything in the “Name Template”, just press the “OK” button.

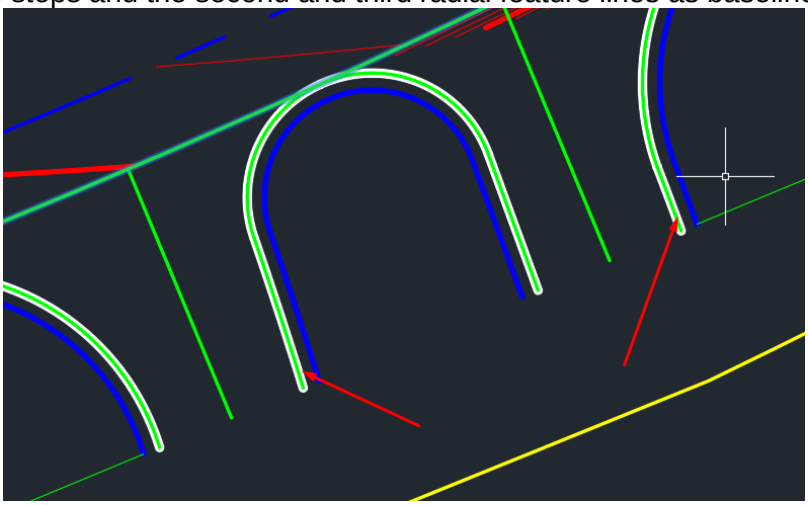




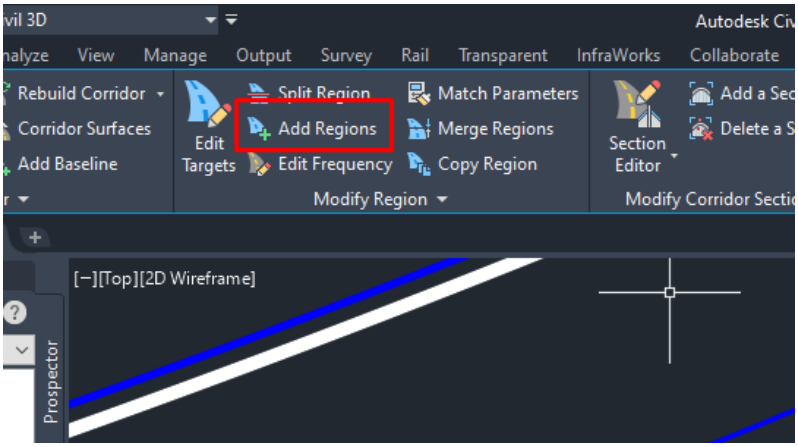
Press the “OK” button in the “Apply feature Line Names” window, and press the “OK” button in the “Create Corridor Baseline” window.



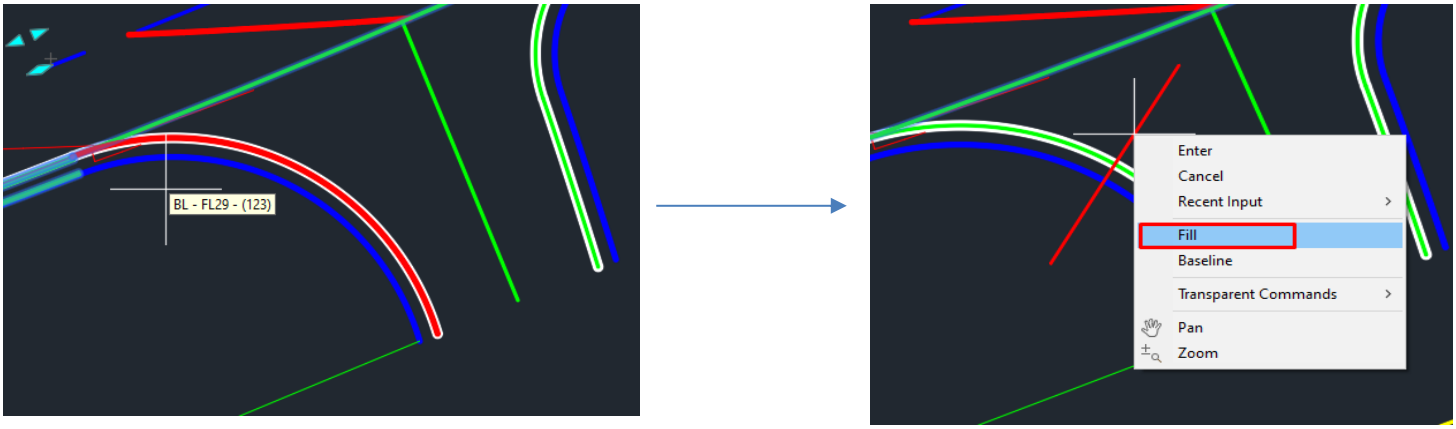
Repeat these steps and the second and third radial feature lines as baselines.



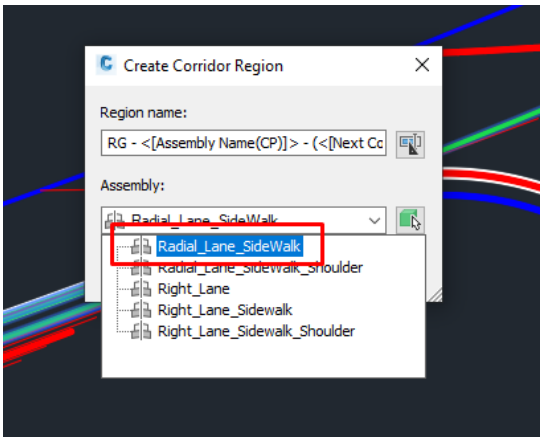
16. Select corridor, then go to the Ribbon and select the “Add regions” command icon.



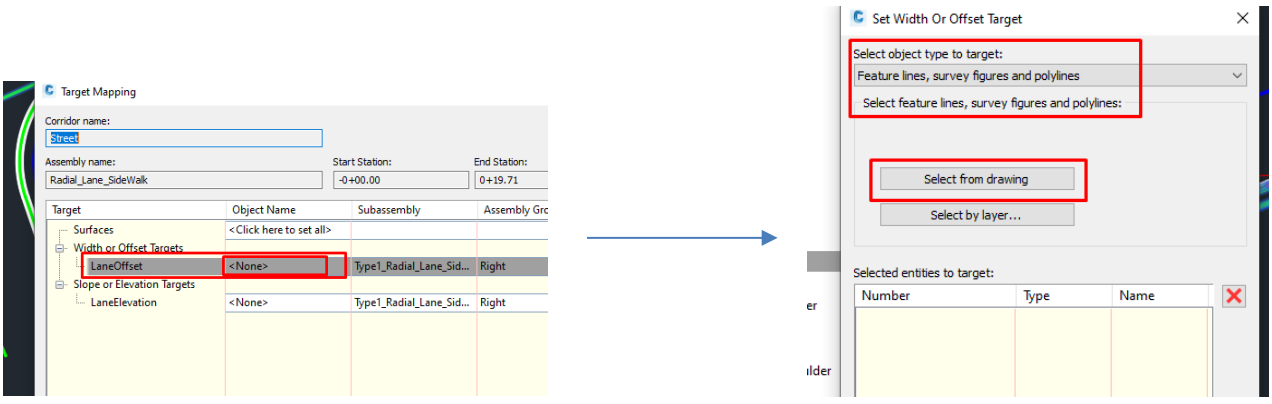
Left-click with the mouse button on the first radial feature line, then right-click with the mouse button and select the “Fill” command.



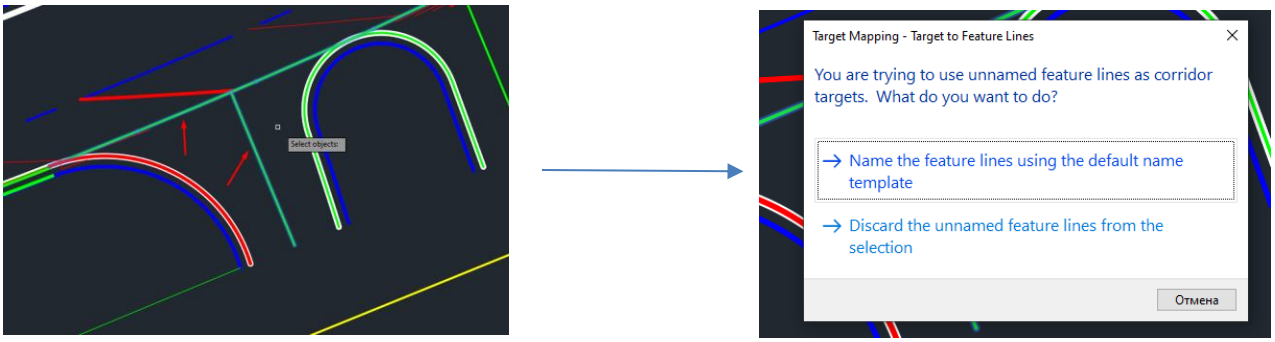
Ine the list of assemblies select Radial_Lane_SideWalk and press the “OK” button.



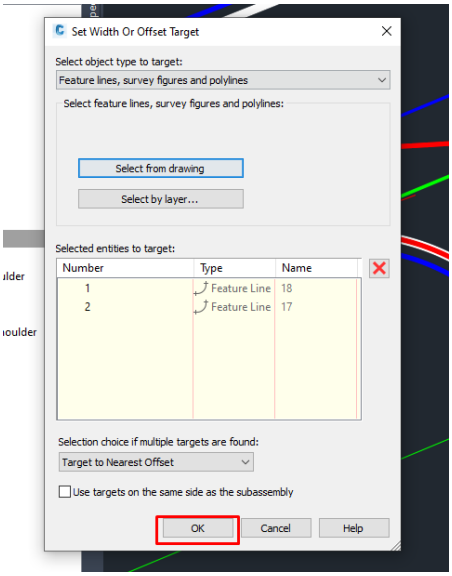
Now, we need to adjust LaneOffset. Press on a “None” for the LaneOffset line. In the “Set Width or Offset Target” window select Feature lines as an object type.



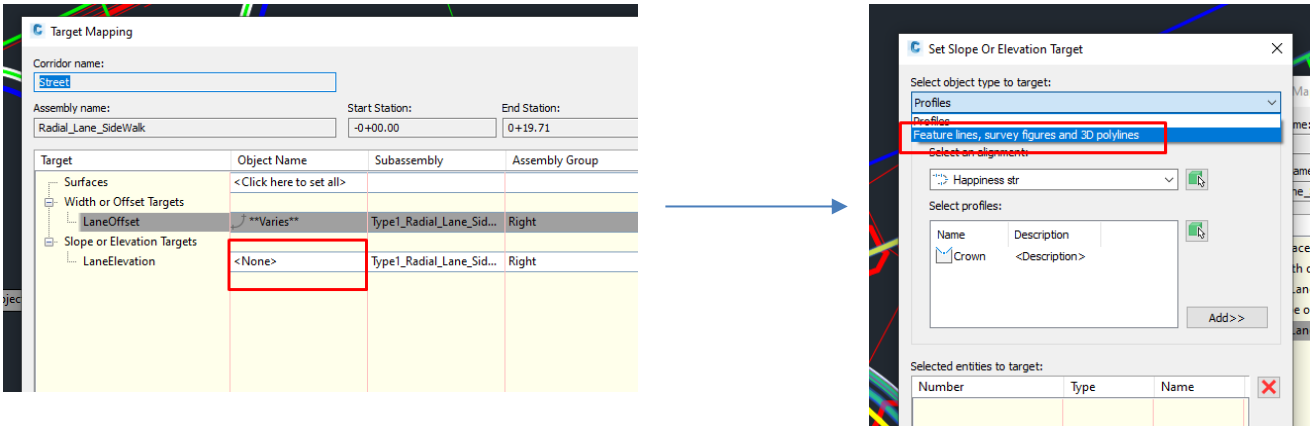
Select the first axis feature line and lane edge feature lines and press Enter. In the upcoming window select “Name the feature lines using the default name template”.



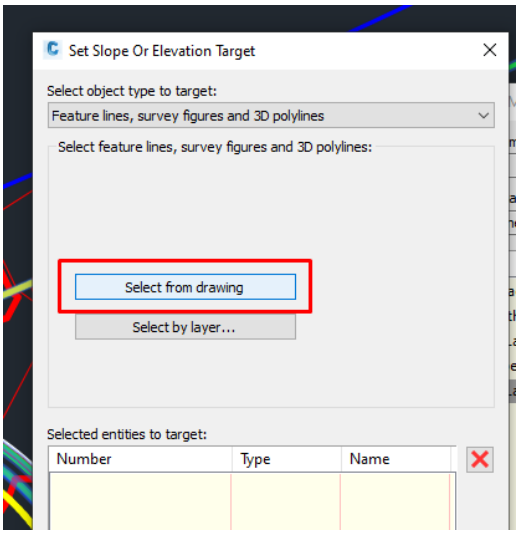
As a result, we should see two feature lines among selected entities to target.

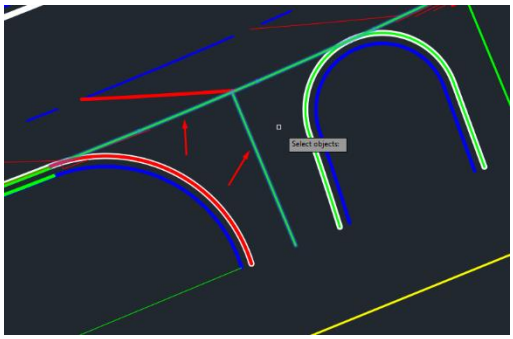


Now, click on “None” for the LaneElevation line, select feature lines as the object type.

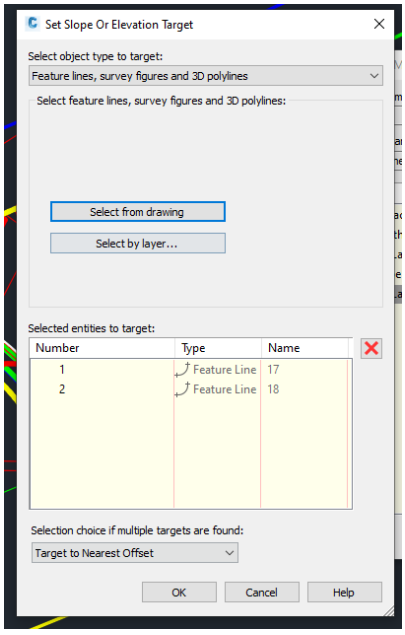


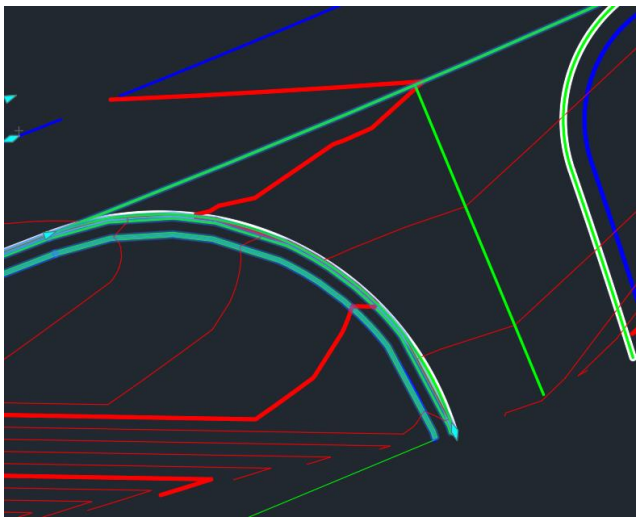
Click on the “Select from drawing” button and select the same two feature lines as for LaneOffset targets.





Selected feature lines will appear as Selected entities to target. Press the “OK” button in all windows. You should see our “Top” surface spreading in the new corridor region with nice and smooth horizontals.



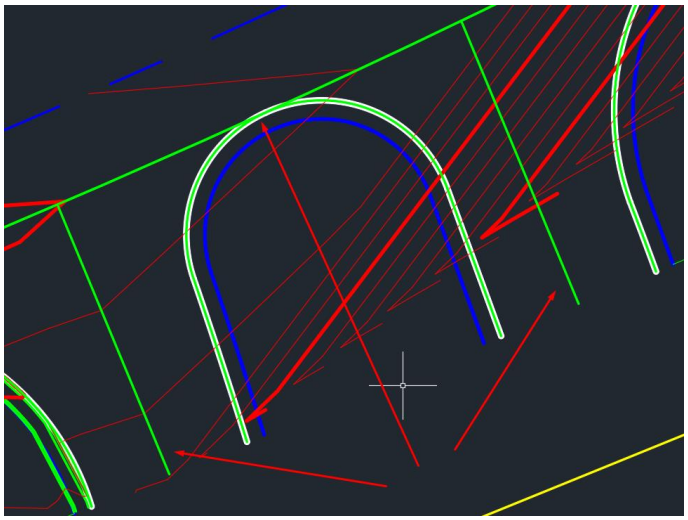


17. Just like we did in step 16, we will add regions for two other radial feature lines.

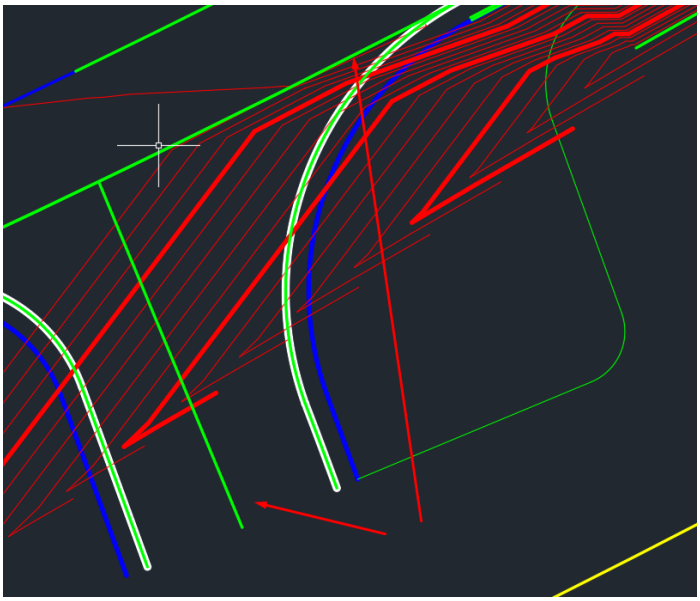
    The order of adding radial regions is the following:

    Add region on Ribbon=> Select feature line, right-click with the mouse button and the "Fill" command=>Select Radial_Lane_SideWalk assembly=>Select the target feature lines for the LaneOffset=>Select the target feature lines for the LaneElevation.

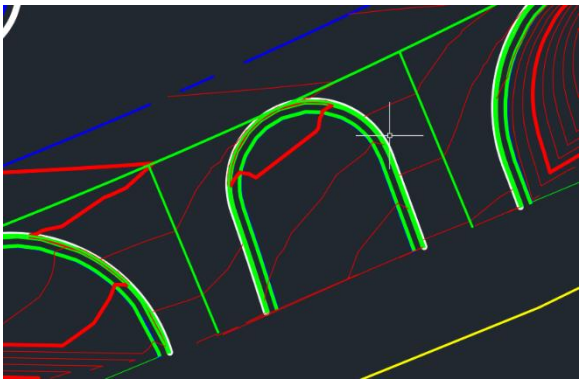
    For the second region you need to select three feature lines as targets for the Lane offset and elevation:

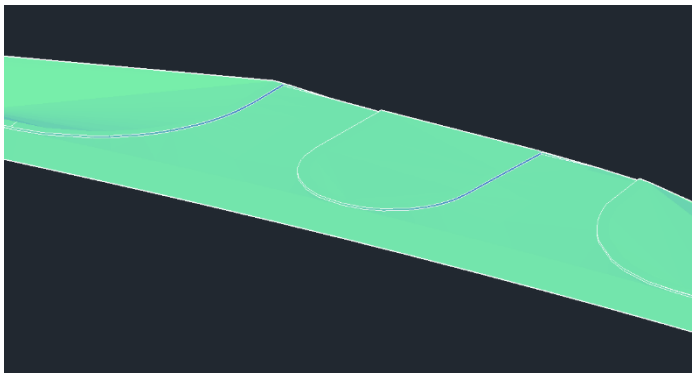


    For the third region you need to select two feature lines as targets for the Lane offset and elevation:



And now road junction is done. Our “Top” surface looks great in plan and in the object viewer.

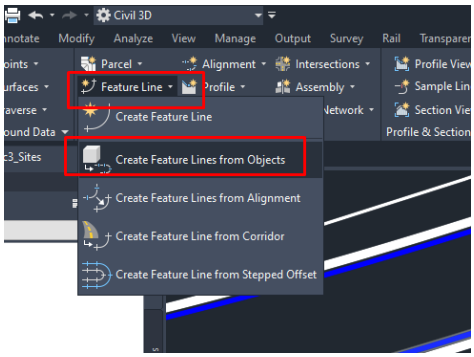


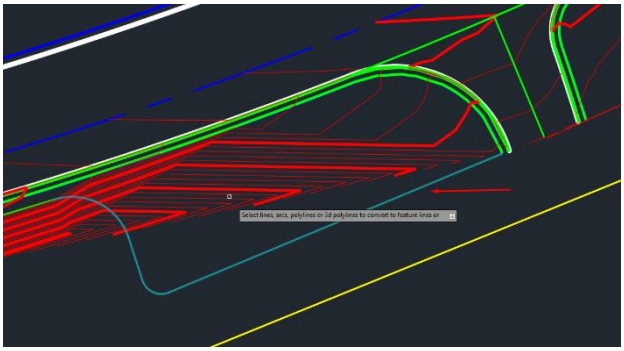


Exercise3. Sites.

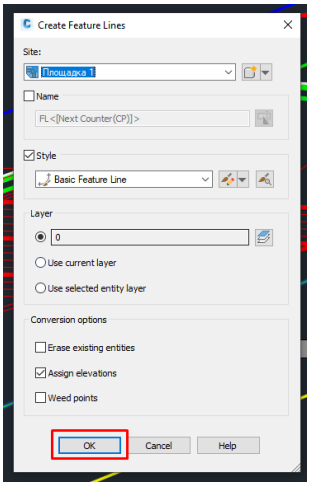
Open the drawing Exercie3.Sites.

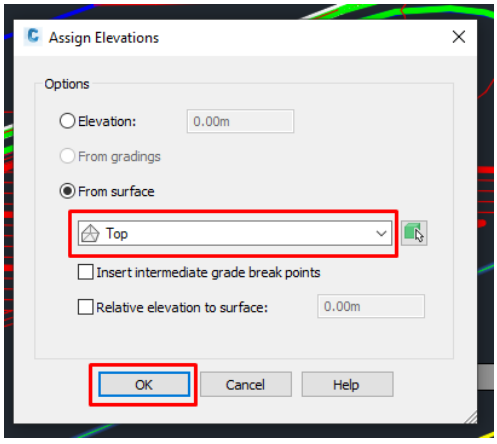
1. Go to the Ribbon=>Feature line=>Create feature lines from object and select the site polyline and press Enter.





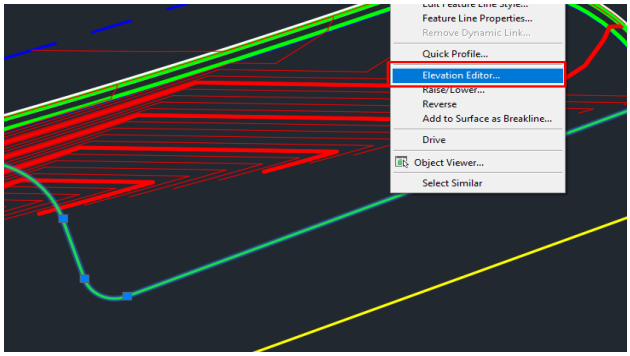
In the “Create feature lines” window press the “OK” button. In the “Assign Elevations” window select the “Top” surface and press the “OK” button.

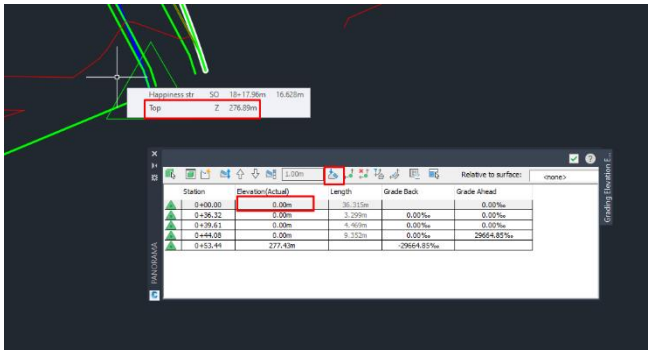


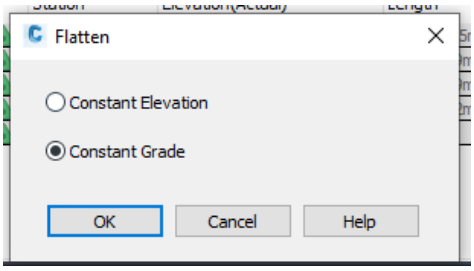


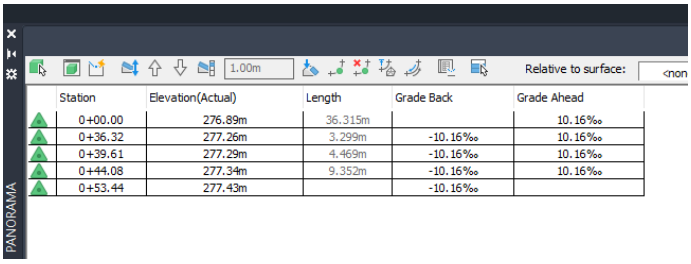
2. Select feature line, right-click with the mouse button and select the “Elevation editor” command.

Move cursor on the “Top” surface near the first vertex, which is near the road junction. Check the elevation – it values is supposed to be 276.89 (there may be a few centimeters difference from your result – that depends on how far from the feature line you move the cursor)
Input the elevation value for the first vertex.
Select all vertexes and press the “Flatten Grade or Elevations” command icon. Select the “Constant grade” option.
Now all vertexes have correct elevation.

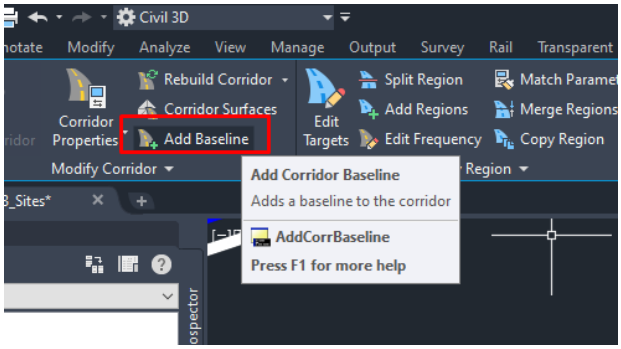




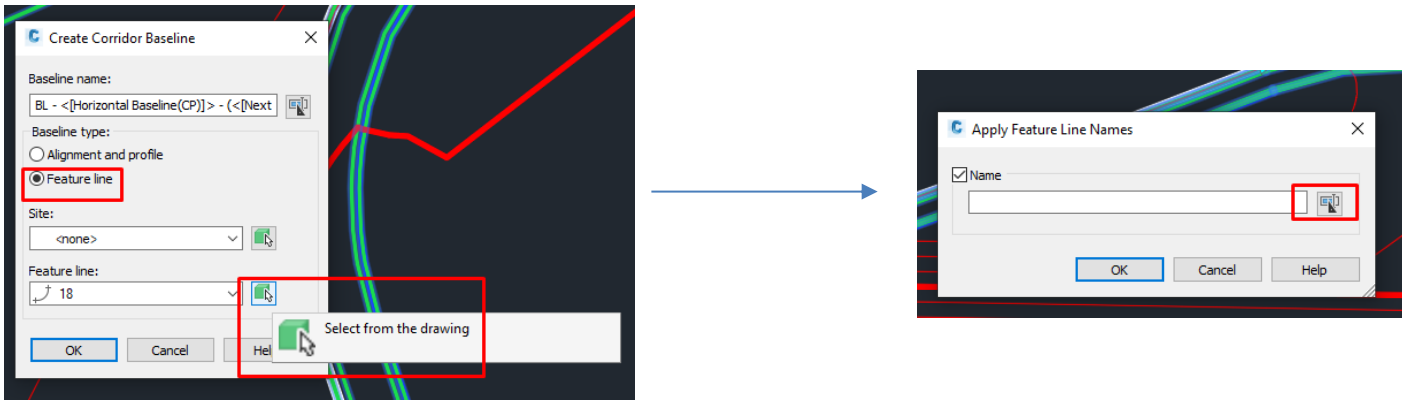




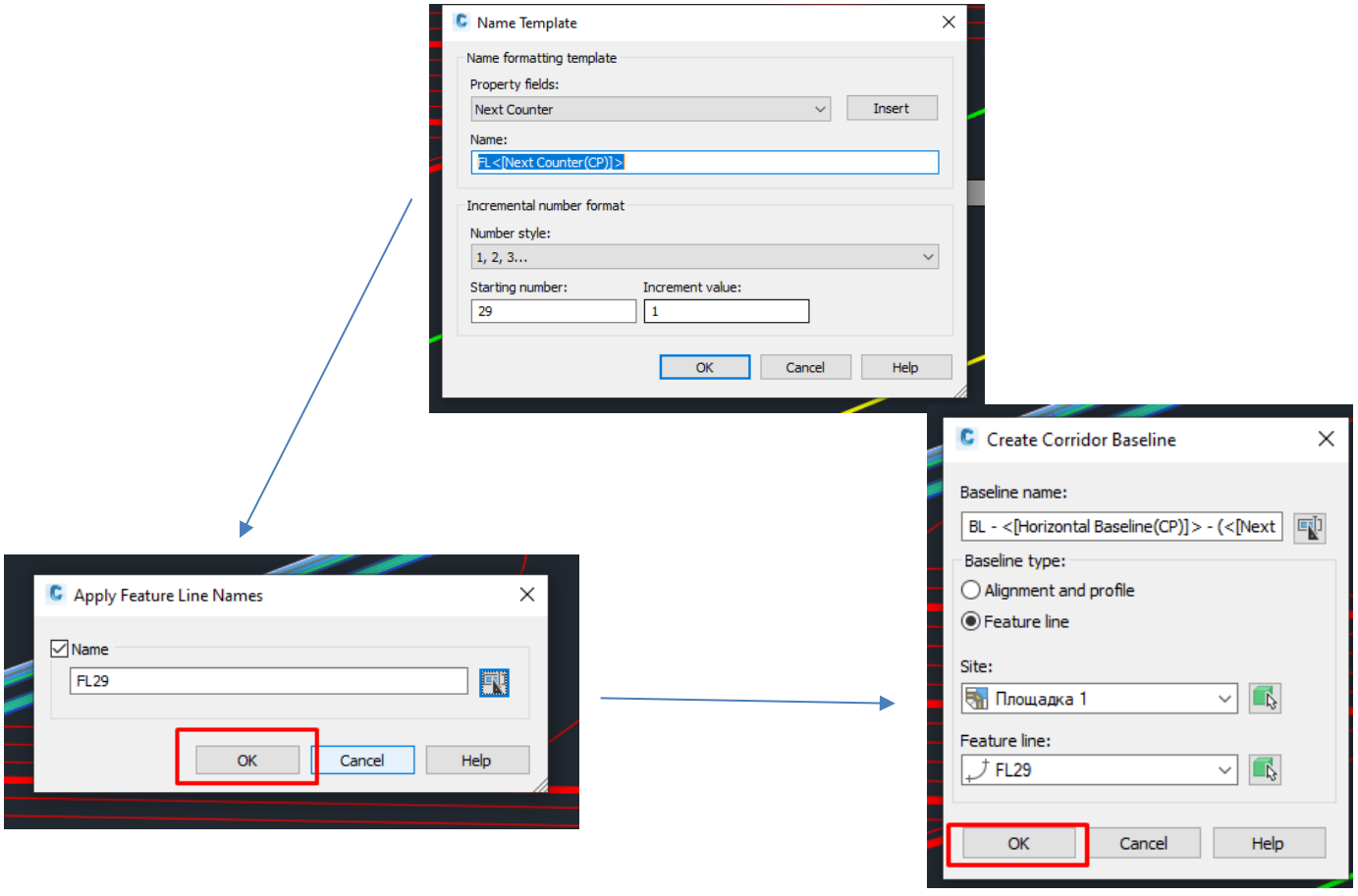
3. Select the corridor. In the Ribbon select the “Add baseline” command. Select the site feature line.



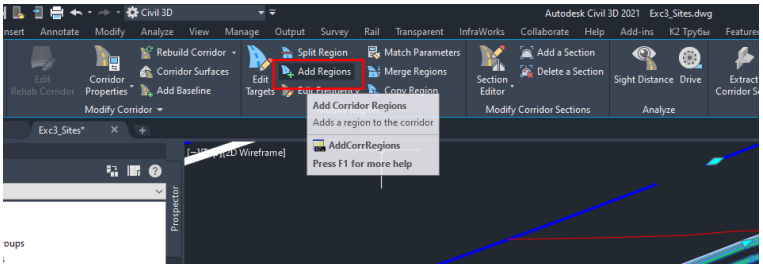
In the “Create Corridor Baseline” select the“Feature line” as a baseline type. Press on the “Select from the drawing” icon and select the site feature line. In the “Apply Feature line Names” window press on the Name Template Icon.

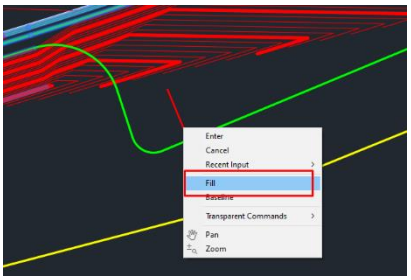


In the “Name template” window press the “OK” button. Then press the “OK” buttons in the “Apply Feature Line Names” and “Create Corridor Baseline” windows.

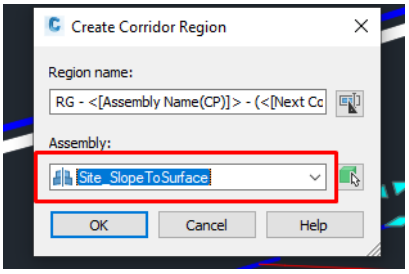


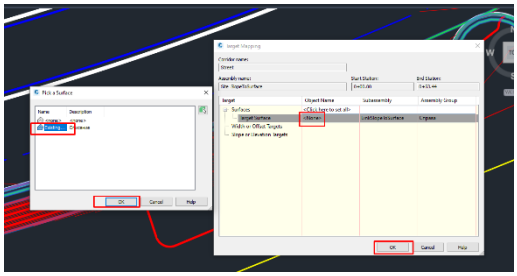
4. Select the corridor, in the Ribbon press on the “Add regions” command icon. Select the site feature line, then right-click with the mouse button and select the “Fill” command.



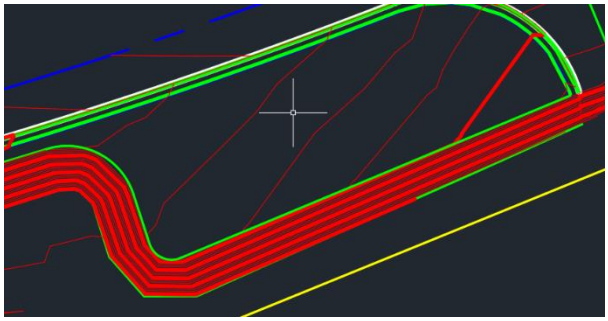


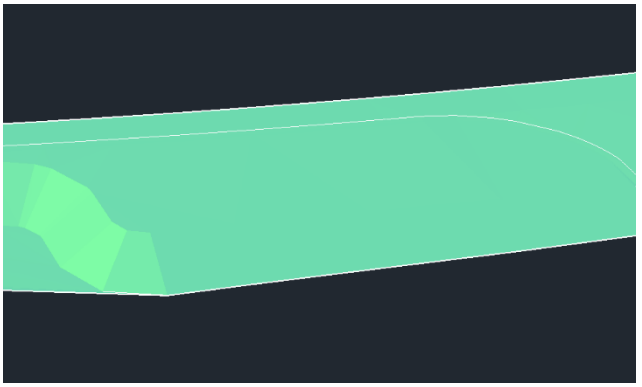
Select Site_Slope To surface assembly. Select the “Existing ground” surface as a target surface.





Our site is done. And our Top surface looks perfect in plan and the Object viewer.



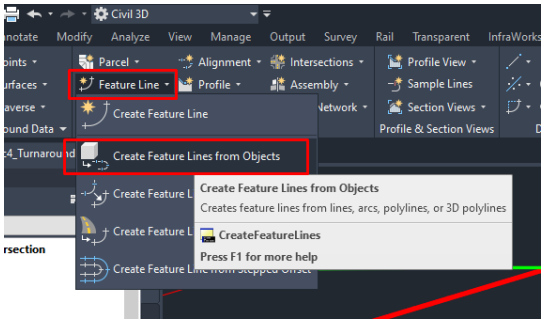


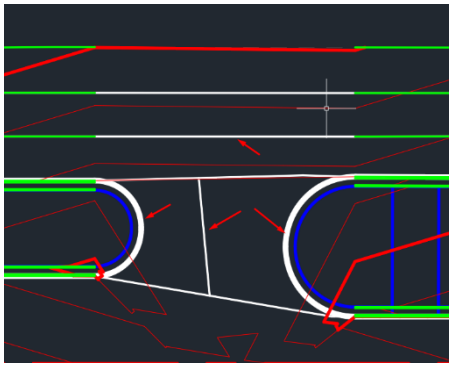
Exercise4. Turnaround intersection.

Open the drawing “Exc4. Turnaround intersection”

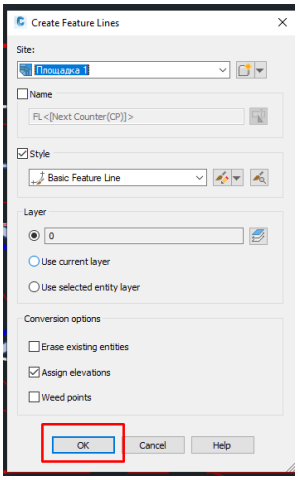
1. On the Ribbond select Feature line=>Creatre feature line from objects.

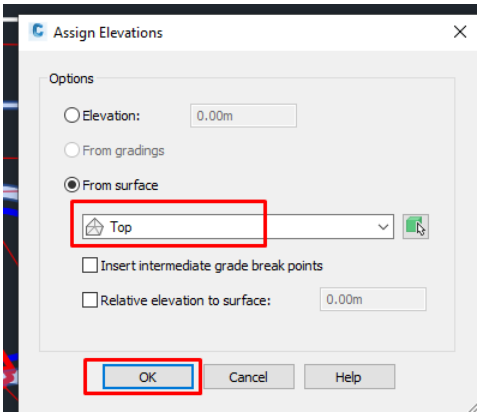
Select the third from the top polyline near the first turnaround intersection.



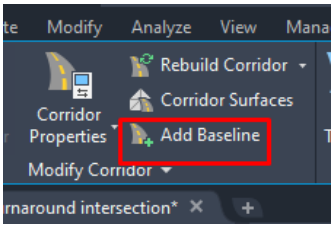


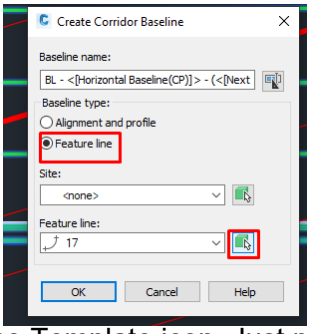
In the “Create feature line” window press the “OK” button. In the “assign elevation” window select the “Top” surface, then press the “OK” button.



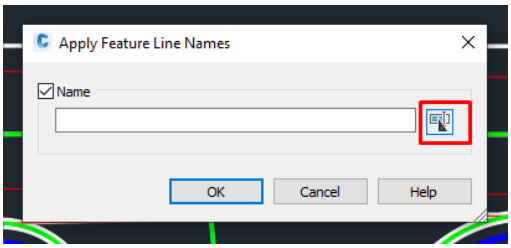


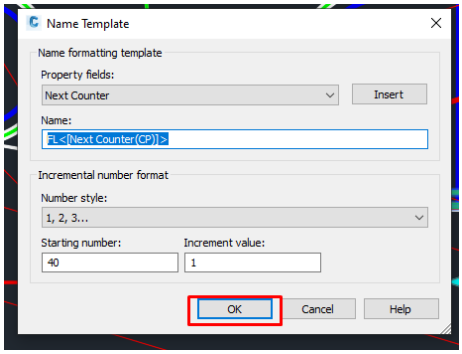
2. Select the corridor, on the Ribbon press on the “Add baseline” icon. Select the feature line as a baseline type.



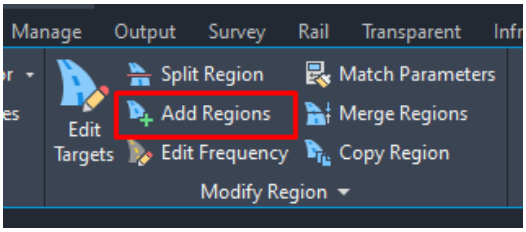


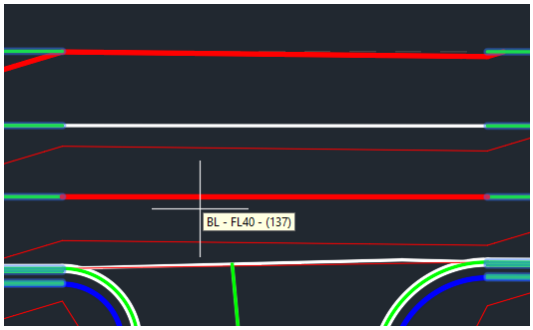
In the “Apply Feature line names” press on the Name Template icon. Just press the “OK” button in the Name Template window and then, press the “OK” button in all previous windows.

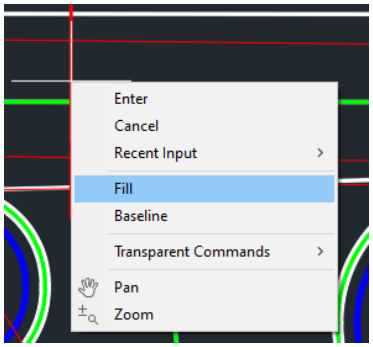


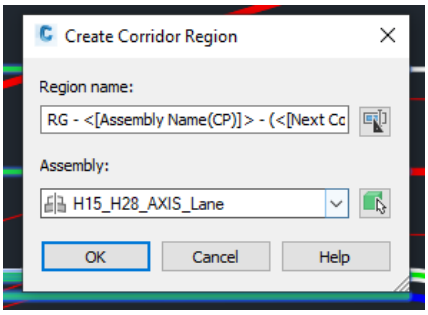


Select the corridor, in the Ribbon=>Add regions. Select the feature line, then right-click with the mouse button and select the “Fill” command. As an assembly, select H15_H28_AXIS_Lane.

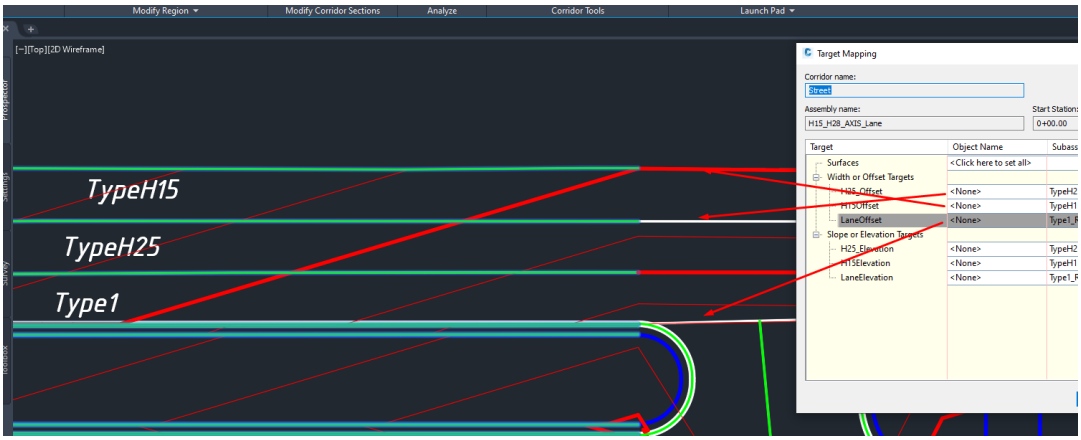


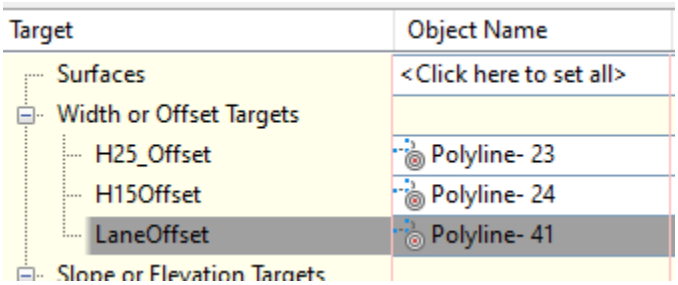




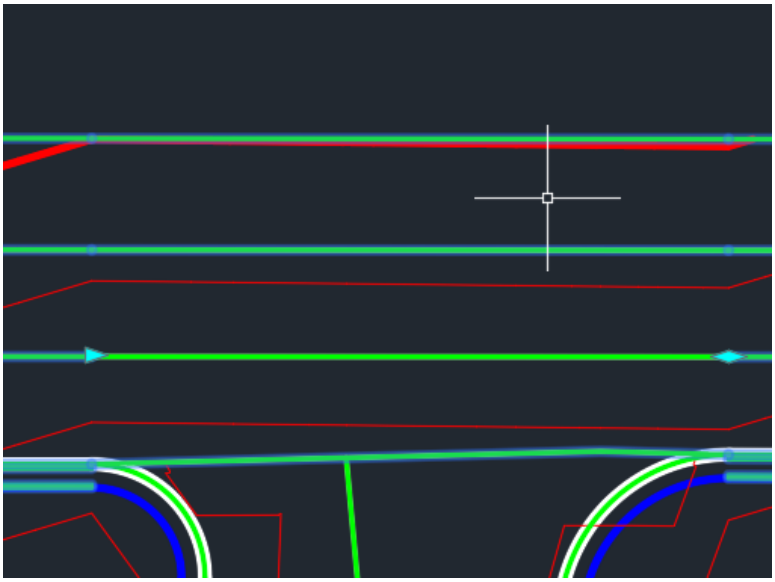


In the Target mapping window adjust Offset targets. Adjust all polylines as targets according to the plan and picture below.

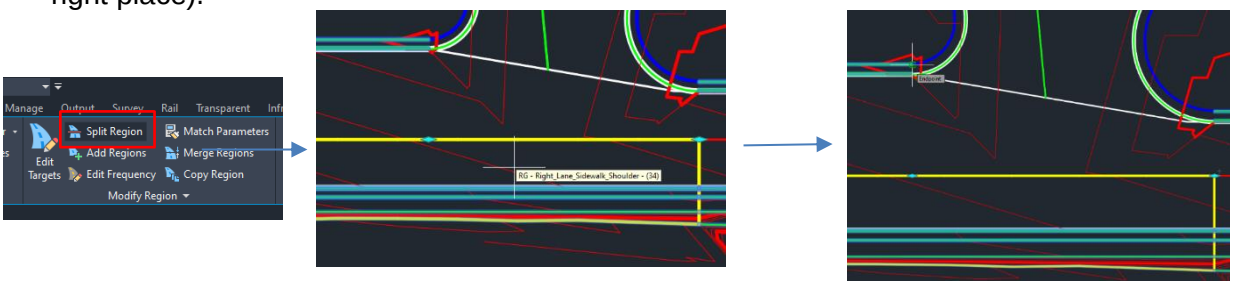




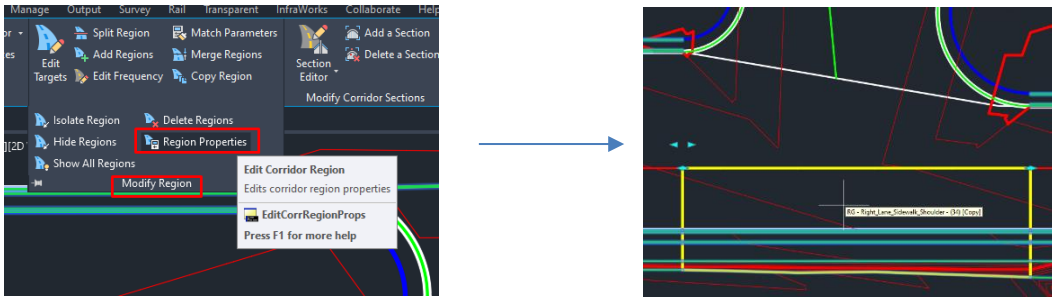
The region is done.



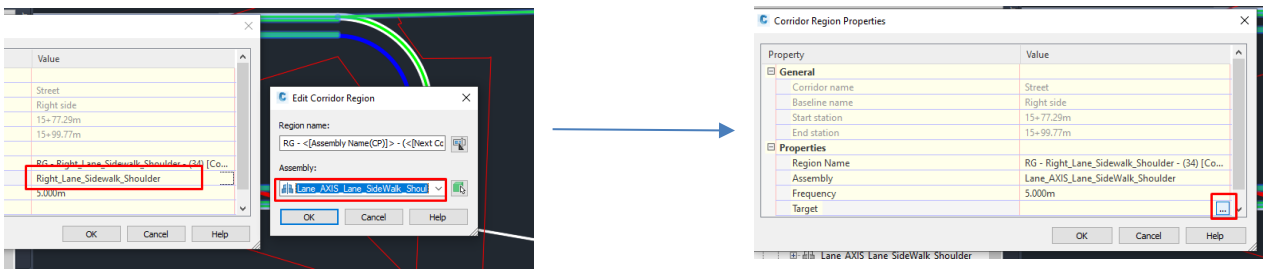
3. Go to the region below our turnaround intersection where we have Right side regions. Select the corridor, go to the Ribbon=> Split region=>Left-click on the endpoint of the sidewalk (see the picture below to make sure you are picking the right place).



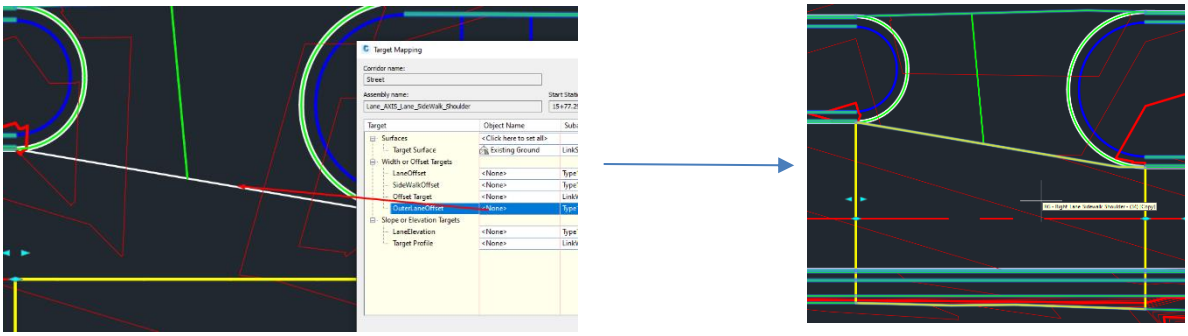
Select the corridor, go the Ribboin=>Left-click the Modify region=>Region properties.



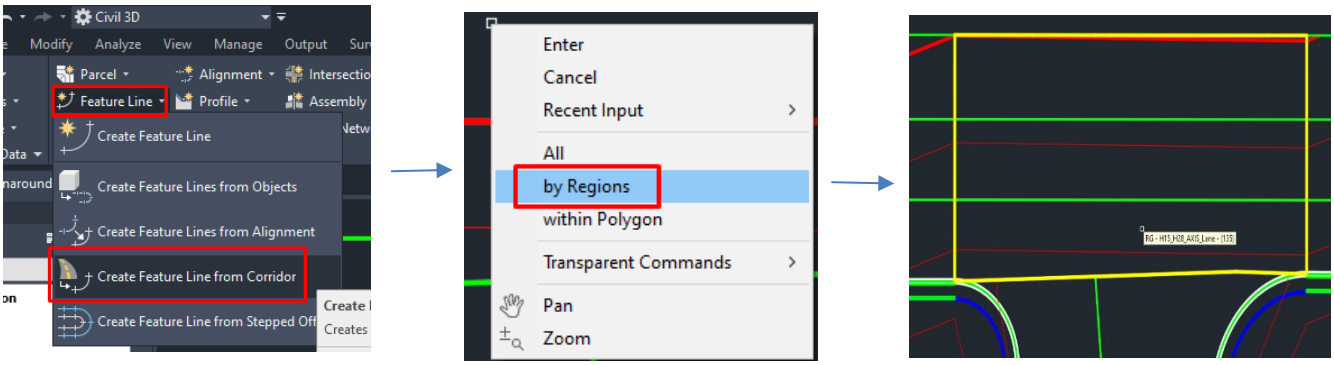
In the Assembly line select Lane_AXIS_Lane_Sidewalk. Then, press in the cell of the Target line, press again on the icon with three dots.



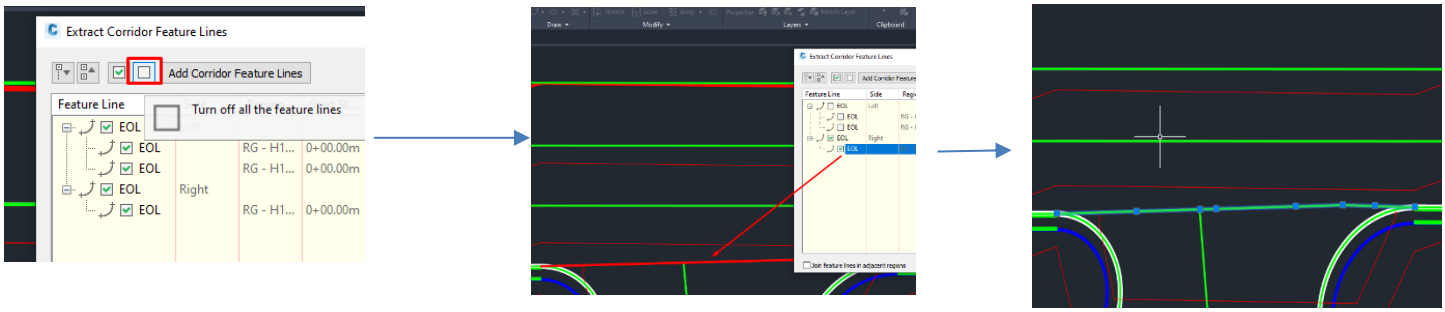
For the target of the OterLaneOffset select the polyline according to the picture below=>OK.



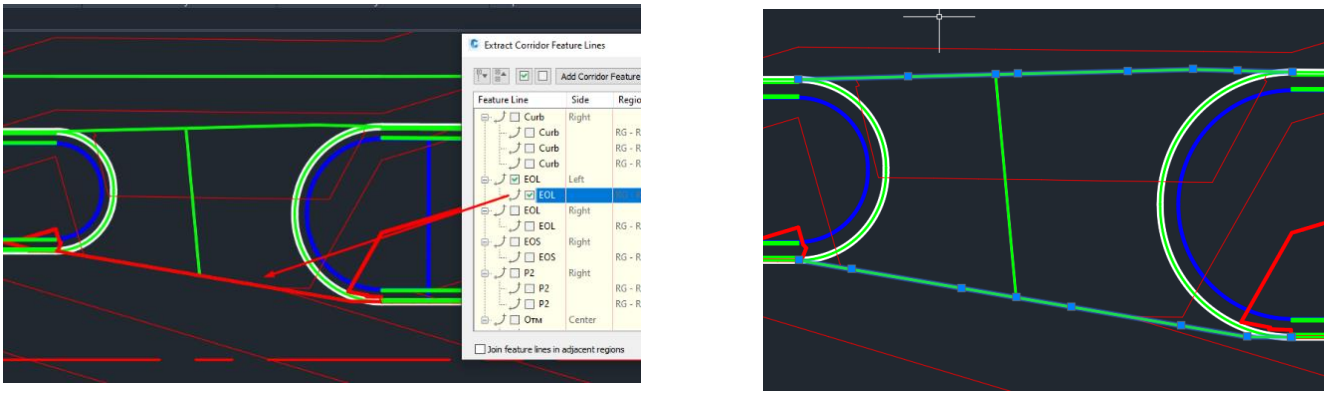
4. Go to the Ribbon=>Feature line=>Create Feature line From Corridor=>Right-clic with the mouse button=>By regions=>Select the region above intersection=>Enter.



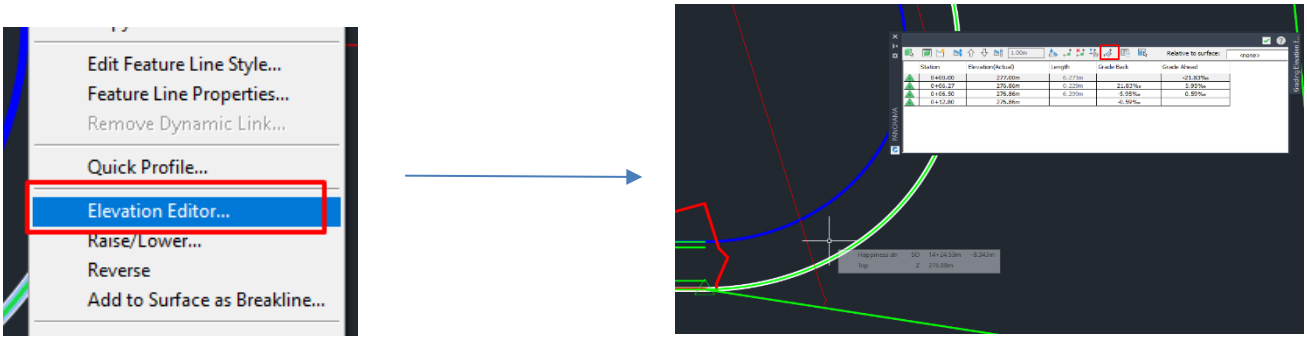
Turn off all the feature lines=>Turn on the last EOL. EOL feature line is done.



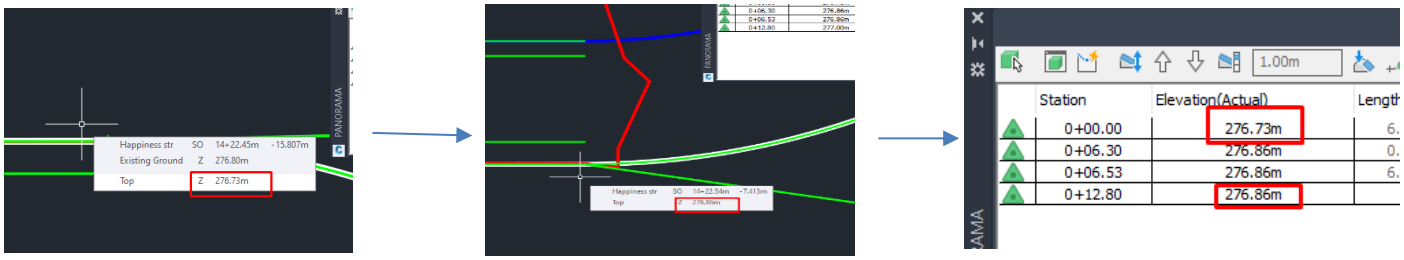
Repeat these steps to create a feature line from the below region. In the “Extract Corridor Feature line” turn off all feature lines and select the first EOL in the list.



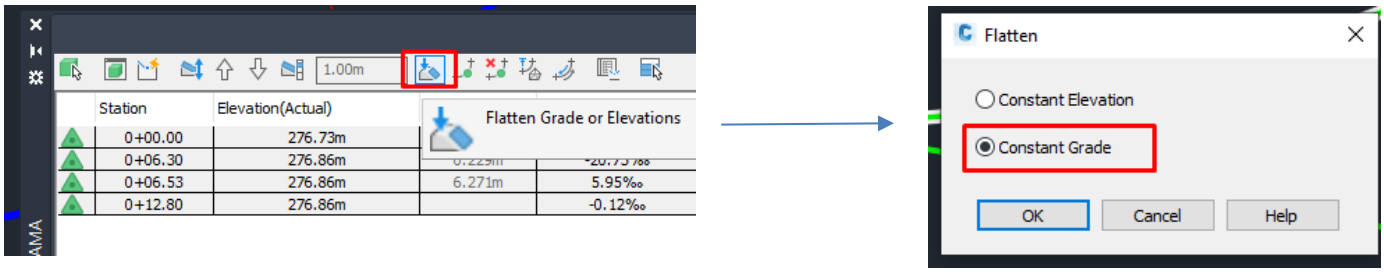
5. Select the first radial feature line. Right-click with the mouse button=>Elevation editor=>Reverse the direction.



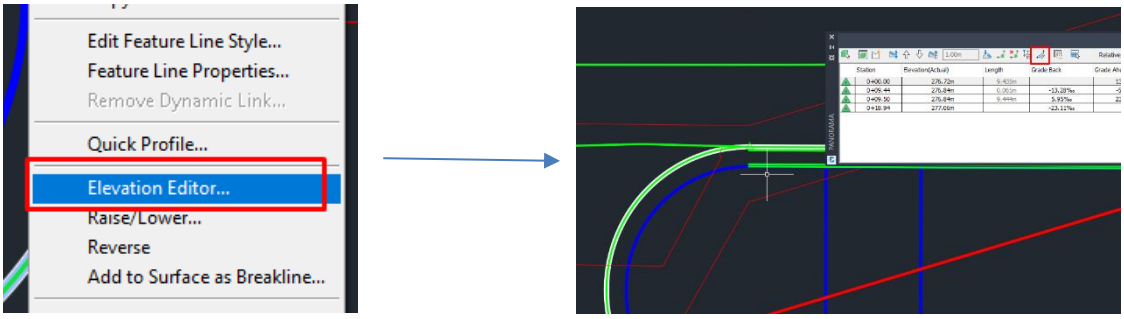
For the first vertex adjust the elevation to 276.73, and for the last vertex 276.86 since these are the elevation of the “Top” surface.



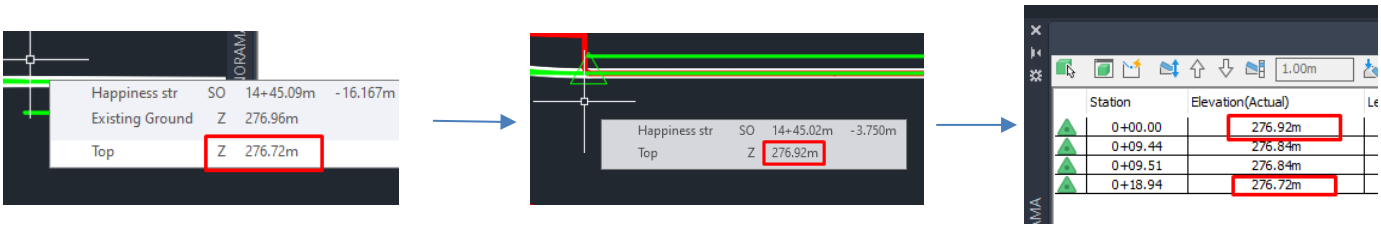
Select all vertexes=>Flatten grade or elevations=>Constant grade.

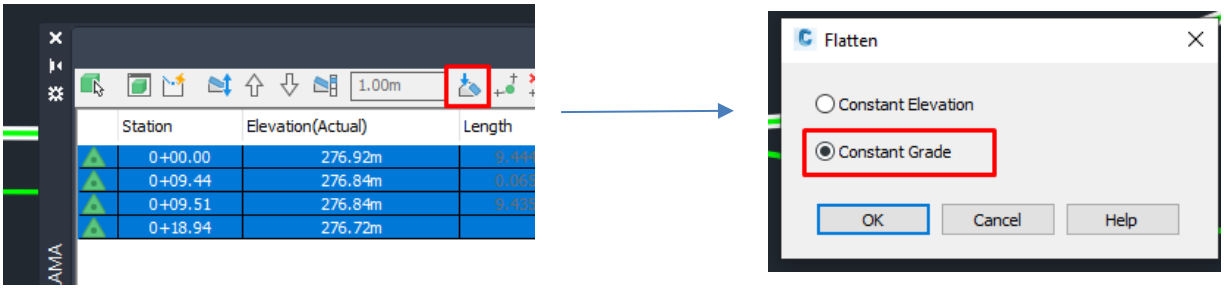


6. Select the second radial feature line. Right-click with the mouse button=>Elevation editor=>Reverse the direction.

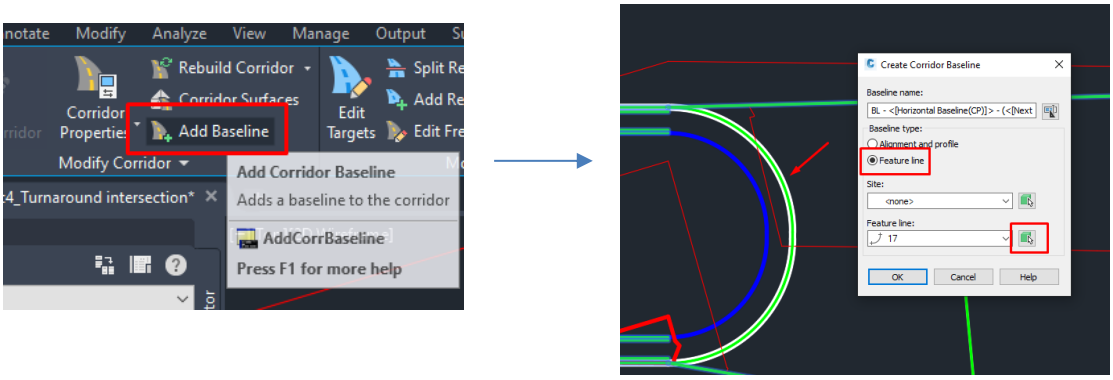


For the first vertex adjust the elevation to 276.72, and for the last vertex 276.92 since these are the elevation of the “Top” surface.

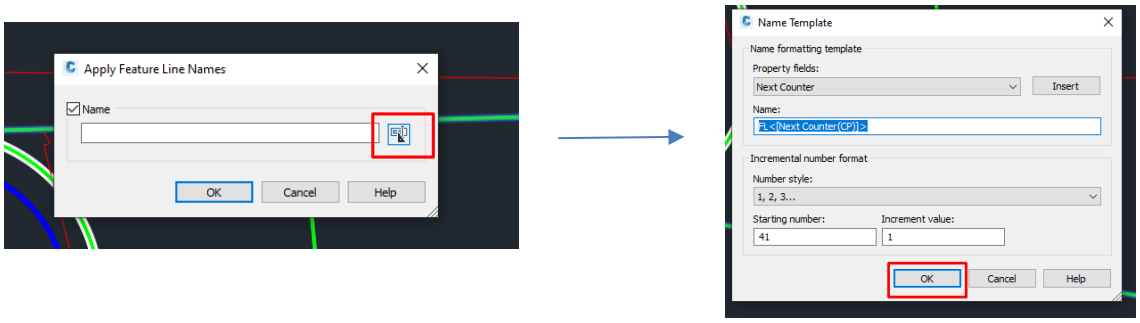




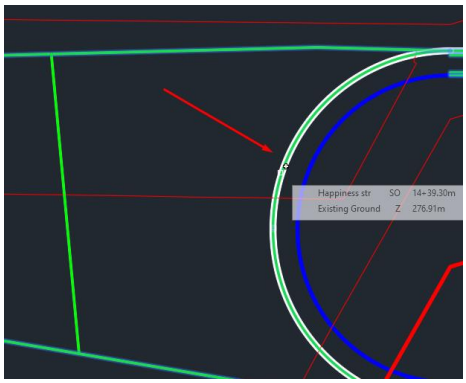
7. Select the corridor=>Ribbon=>Add Baseline=>Select Feature line as a baseline type=>Select the first radial feaure line



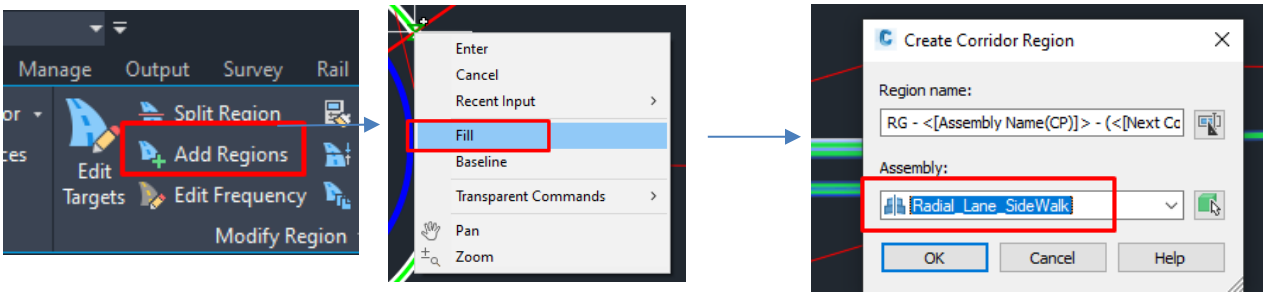
Press on the Name template icon=>Press on the “OK” button in the Name template window=>Press the “OK” button in all previous windows.



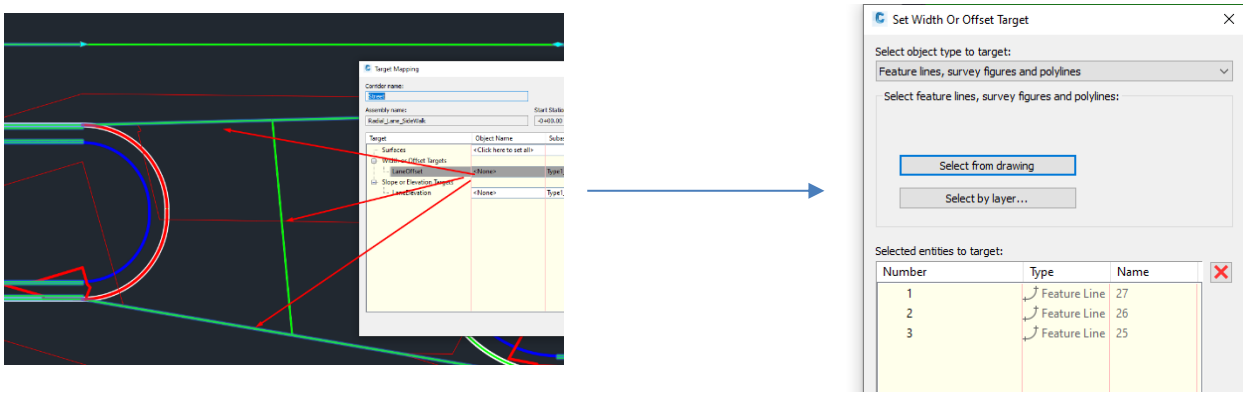
8. Repeat these steps and add the second radial feature line as a baseline.



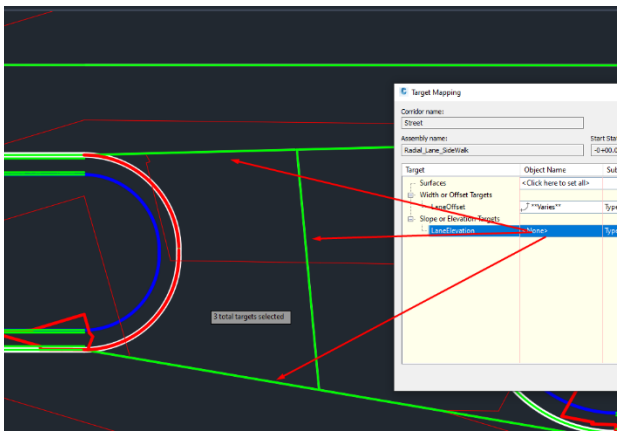
9. Select the corridor=>Ribbon=>Add regions=>Select the first radial feature line=>Right-click with the mouse button=>Fill=>Select Radial_Lane_Sidewalk assembly.

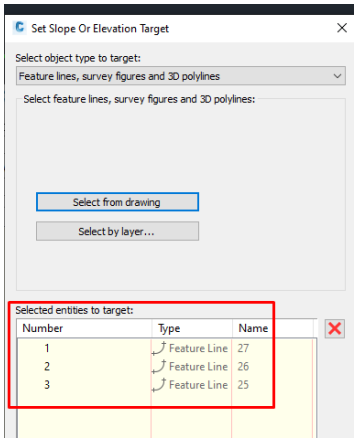


Select three feature lines (turnaround axis and two EOL) as targets for the LaneOffset.

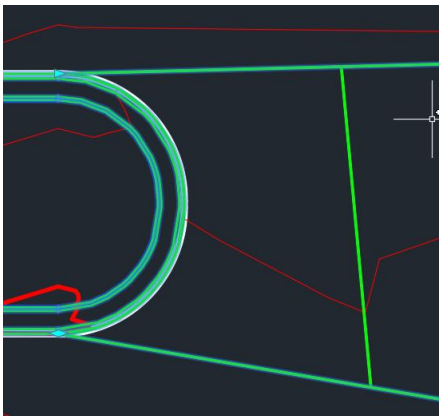


Select the same feature lines as targets for the LaneElevation.

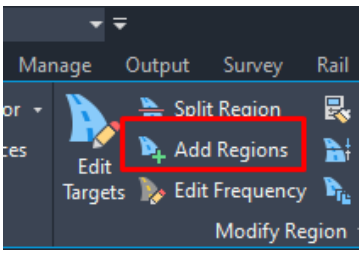


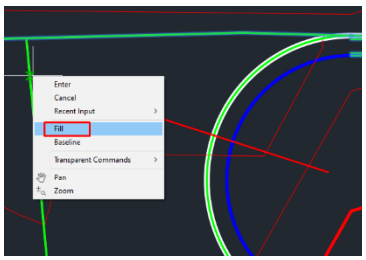


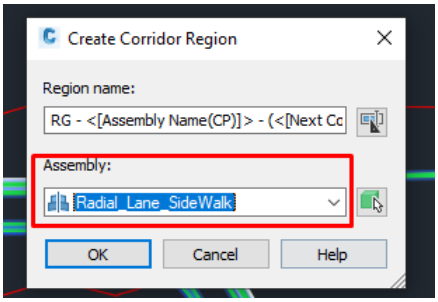
The region is ready.



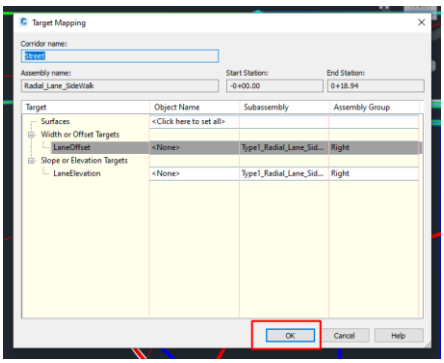
10. Select the corridor=>Ribbon=>Add regions=>right-click with the mouse button=>Fill=>Radial_Lane_Sidewalk assembly.

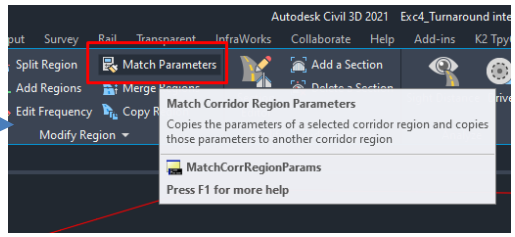


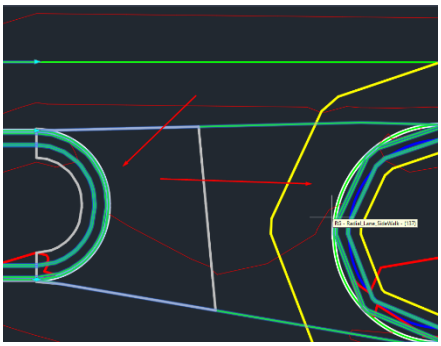




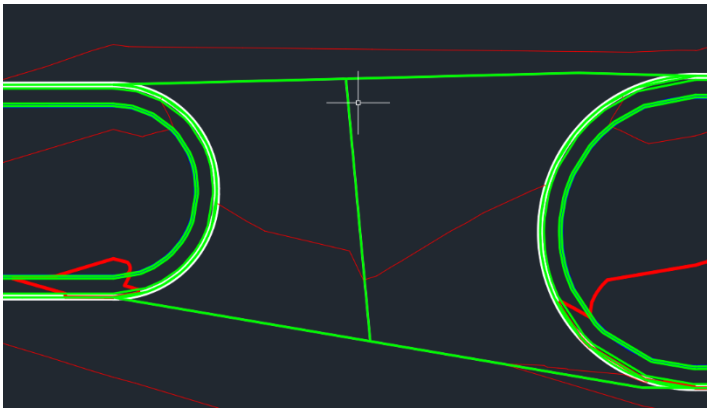
Do not adjust any targets in the Target mapping window. Press the “OK” button.
Selecy the corridor=>Ribbon=>Match parameters=>Left-click in the left radial region=>right-click in the right radial region.

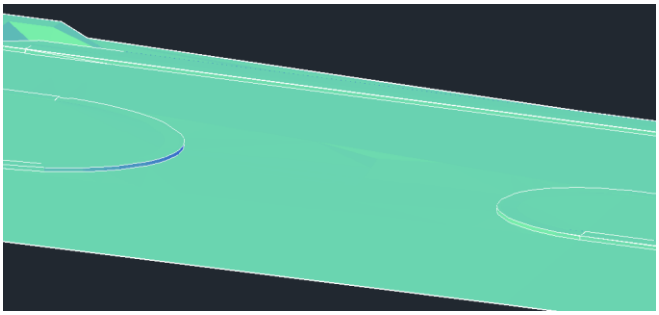






The turnaround intersection is ready.

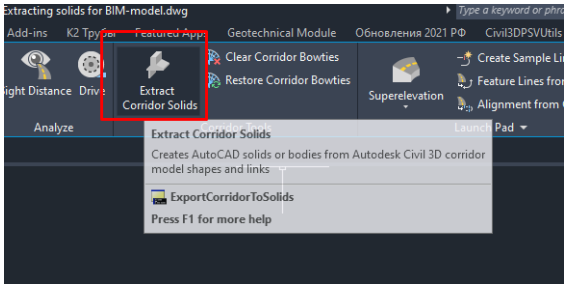


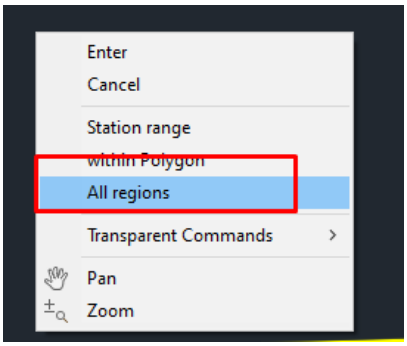


Exercise5. Extracting solids for BIM-model.

Open the drawing Exc5_Extracting solids for BIM-model.dwg

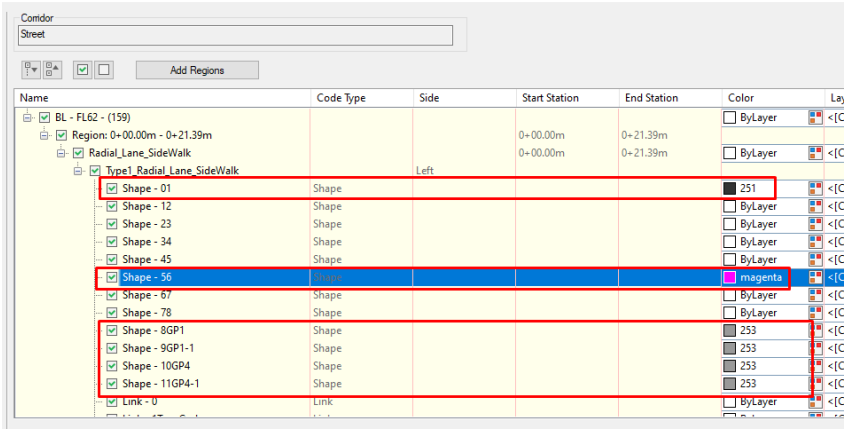
1. Select the corridor=>Ribbon=>Extract Corridor Solids=>Right-click with the mouse button=> All regions



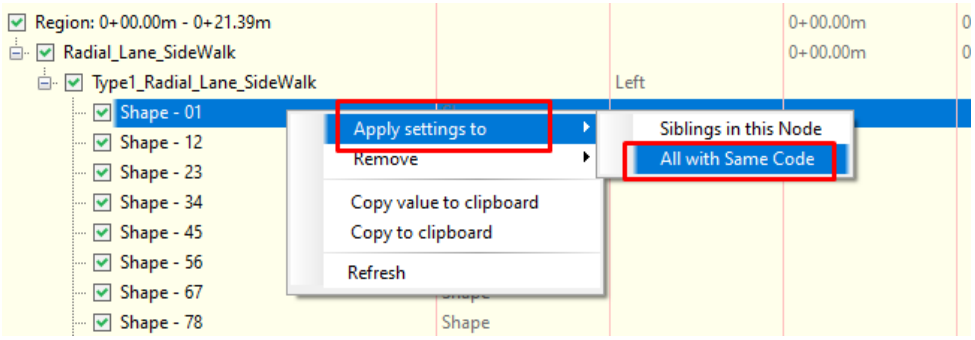


2. Adjust colours for shapes in the following way:

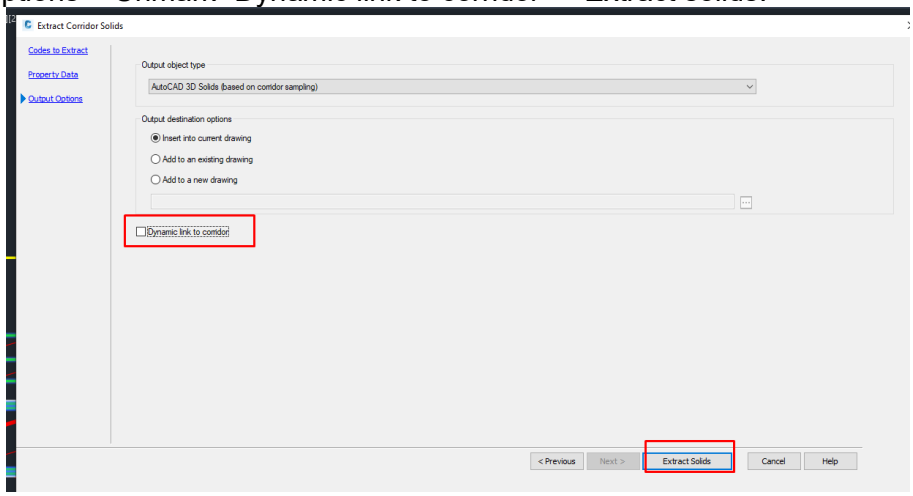
Shape 01 (Asphalt) = 251
Shape 56 (Sidewalk) = 6(magenta)
Shape 8GP1,Shape 9GP1-1, Shape 10GP4, Shape11GP4-1=253



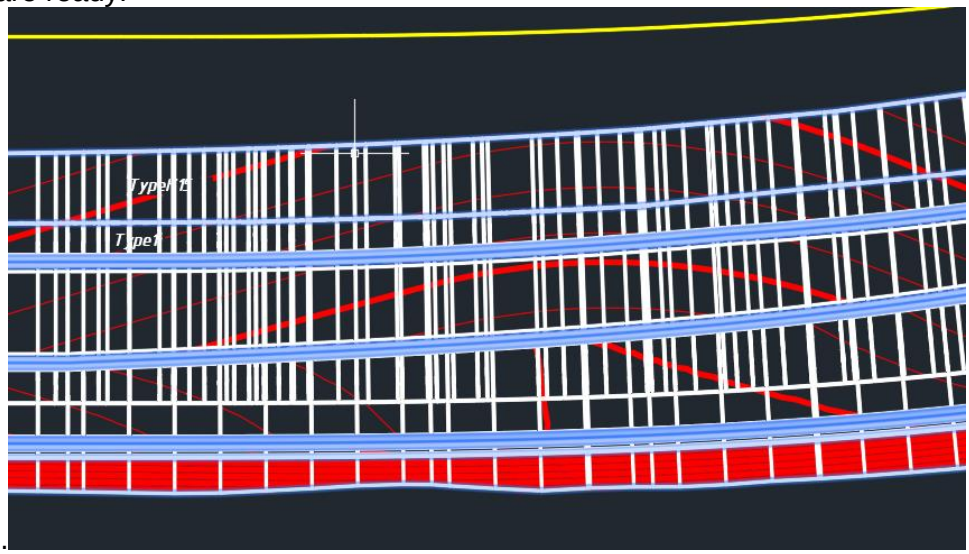
Right-click in each adjusted shape=>apply settings to=>All with Same code.



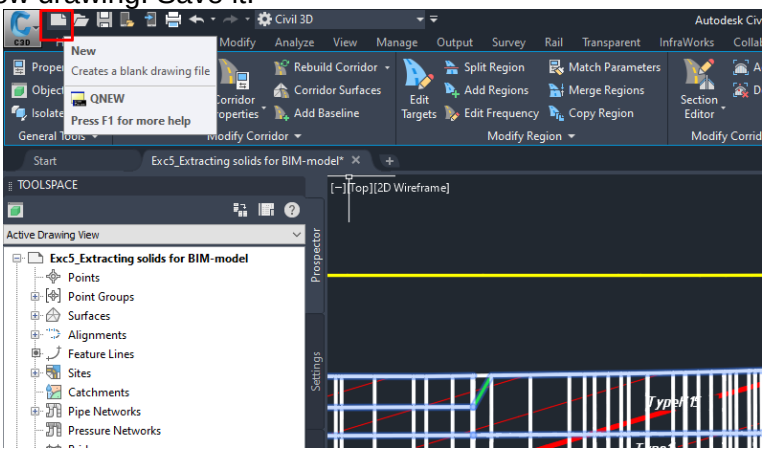
Output Options=>Unmark “Dynamic link to corridor”=>Extract solids.



Solids are ready.

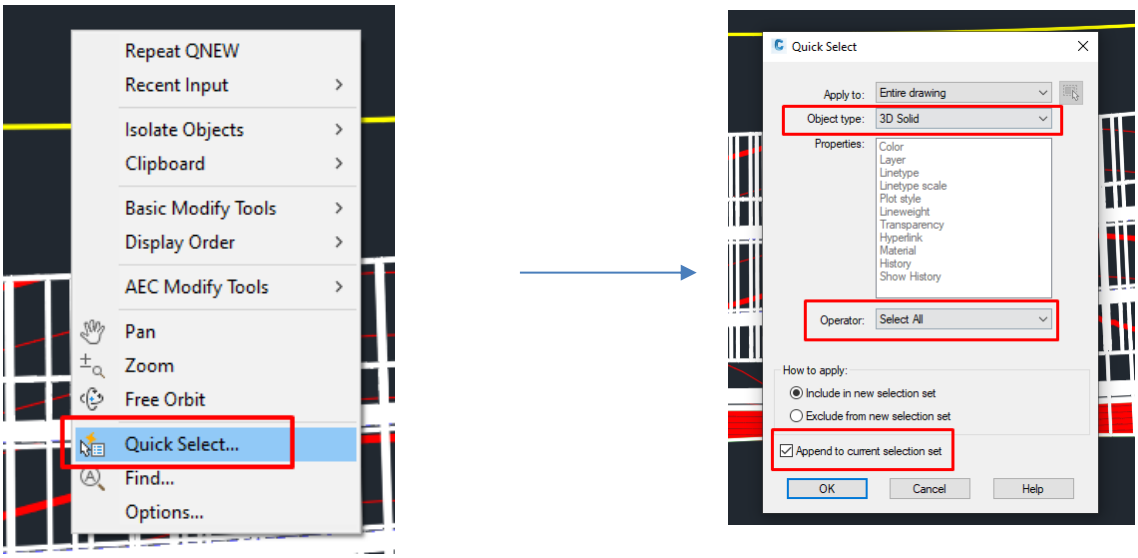


3. Create a new drawing. Save it.

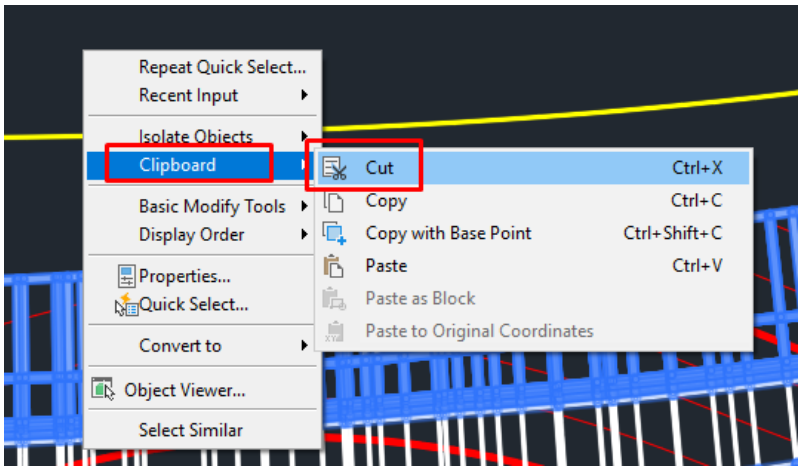


4. Return to the file with solids. Right-click with the mouse button=>Quick select.

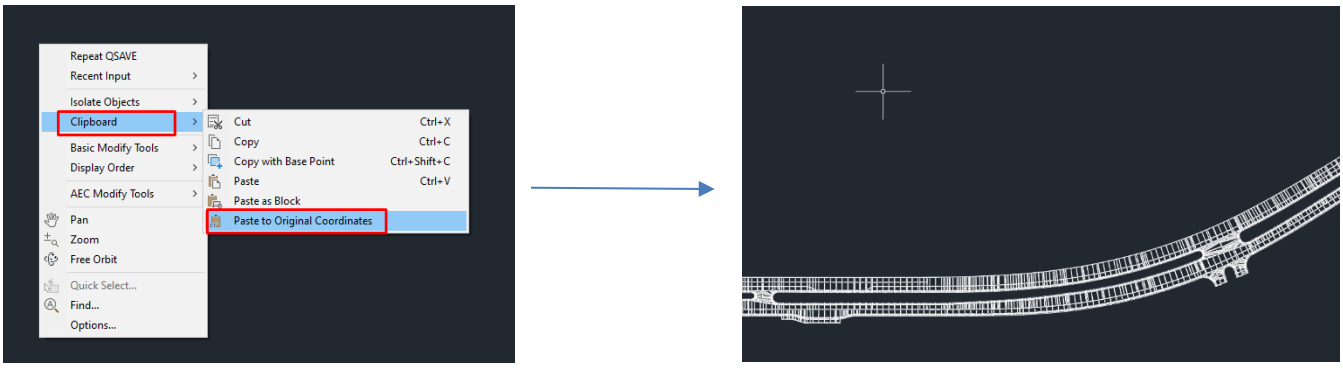
Oject type= 3D solid
Operator = Select all
Mark “append to current selection set”
OK



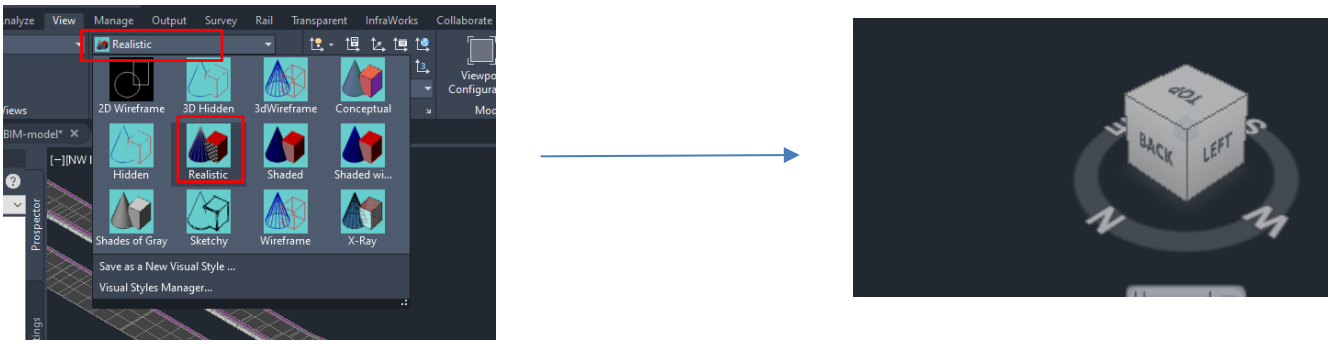
5. While all solids are selected right-click with the mouse button=>Clipboard=>Cut

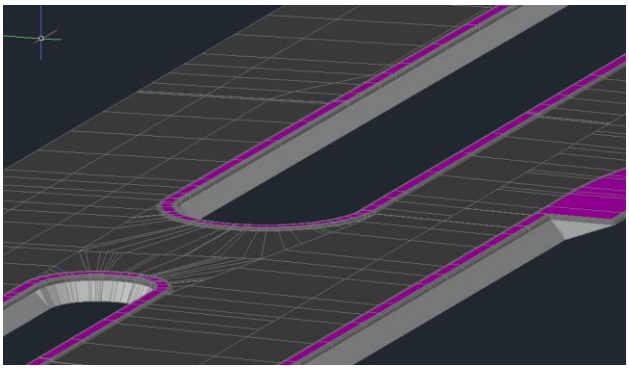


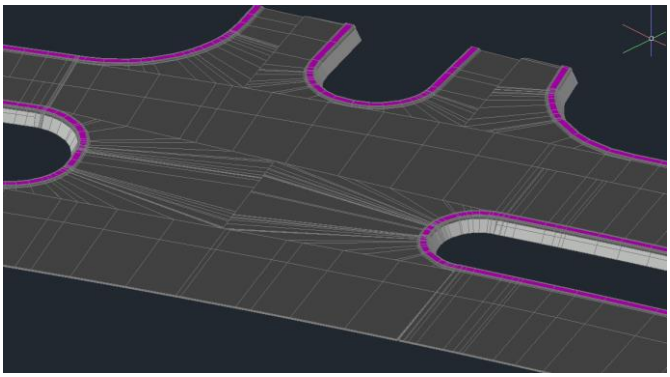
6. Go to the “My BIM-model” file=>Right-click with the mouse button=>Clipboard=>Paste to original coordinates=>double-click with the wheel mouse button to see all solods.



7. Ribbon=>View palette=> Visual style=> Realistic
Use View Cube or rotate the model with Shift+Mouse Wheel Button to get the best angles for viewing.



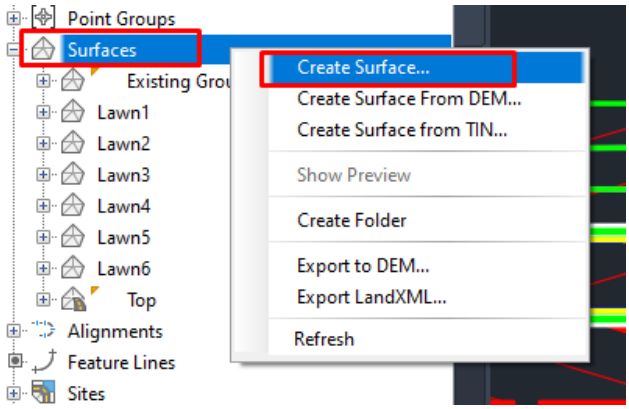




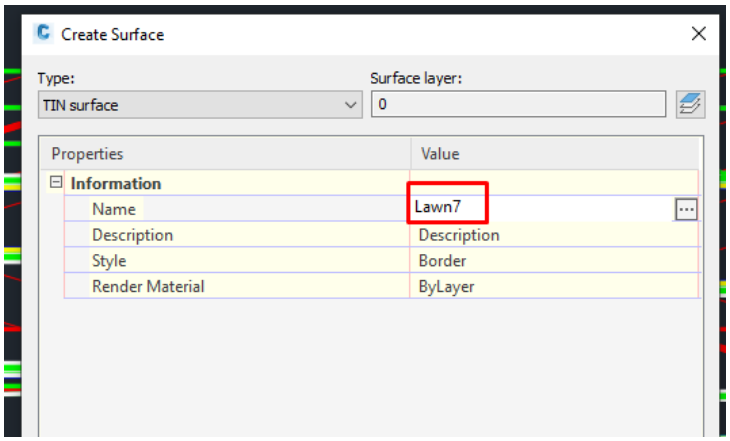
Exercise6. Extracting solids from grass coverage for BIM-model.

Open the drawing “Exc6_Extracting solids from grass coverage for BIM-model”.

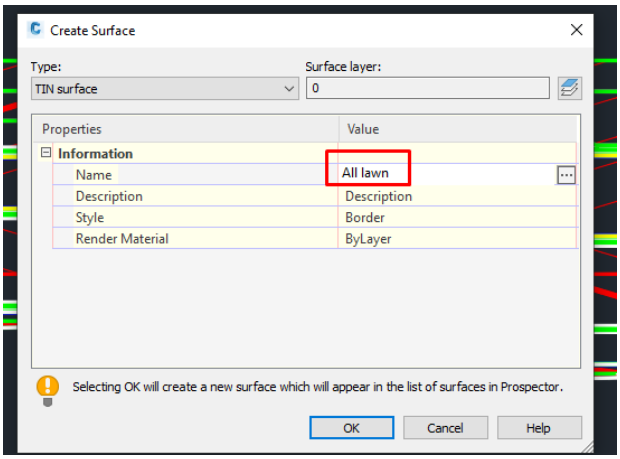
1. Toolspace=>Right-click in Surfaces=>Create surface.

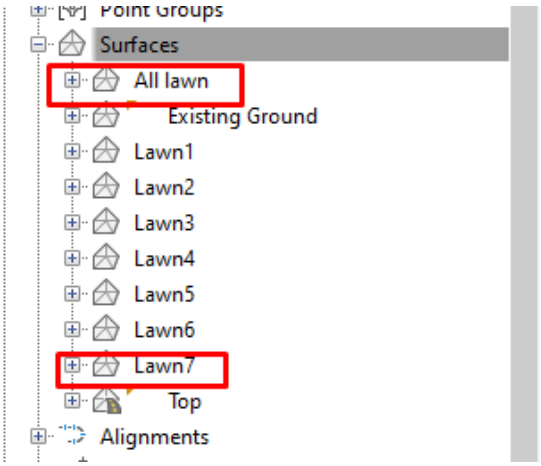


Name=Lawn7=>OK

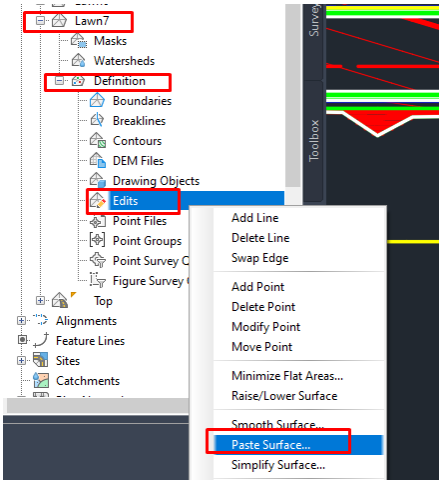


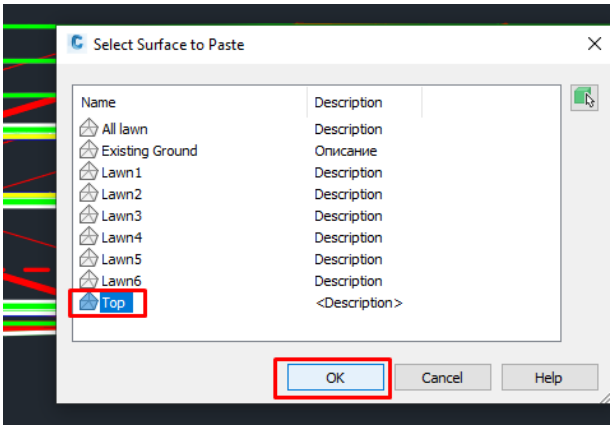
Create another surface and name it “All lawn”.



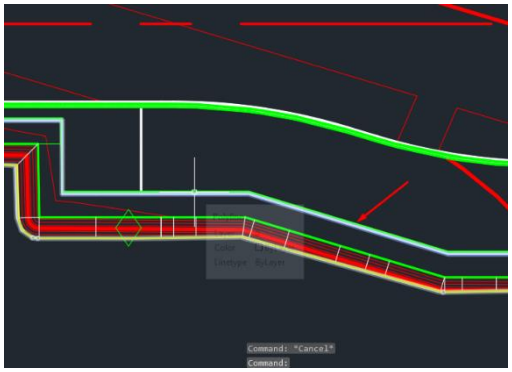


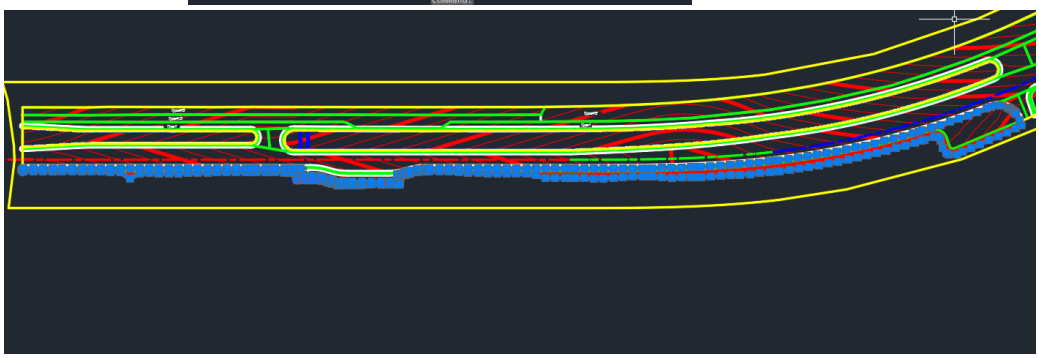
2. Toolspace=>Lawn7=>Definition=>Right-click in “Edits”=>Paste surface. Select the “Top” surface=>OK.



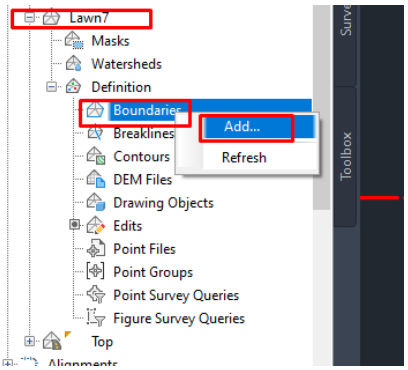


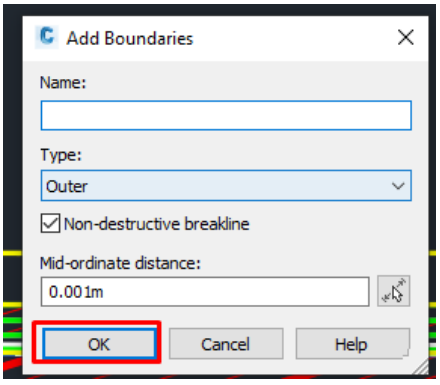
There is a polyline at the bottom of the corridor. The best way to select it near the bus station sidewalk.



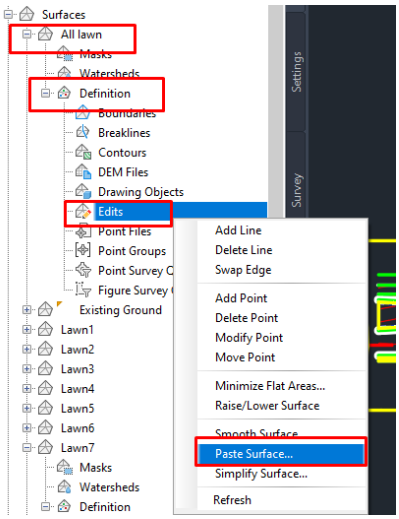


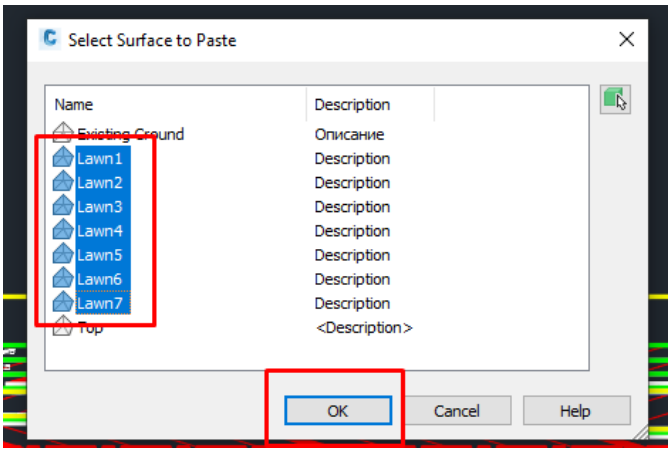
3. Toolspace=>Surfaces=>Lawn7=>Definition=>Right-click in Boundaries=>Add.



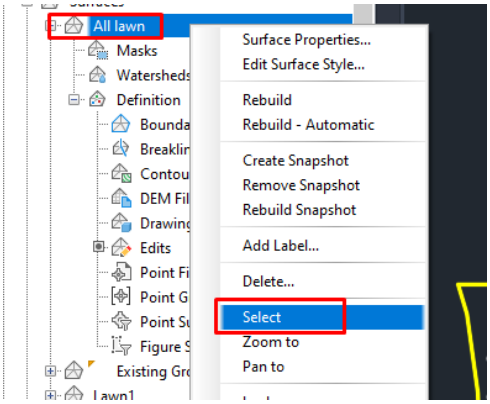


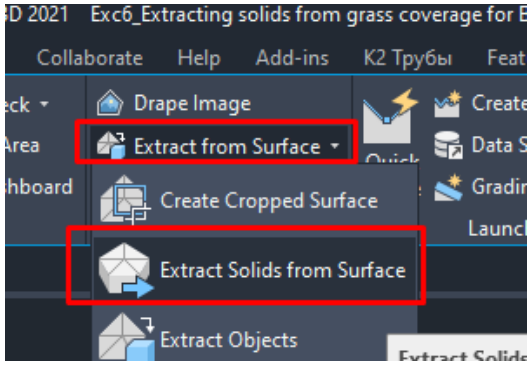
Toolspace=>Surfaces=>All lawn=>Definition=>Edit=>Paste surface=>Select all Lawn surfaces=>OK.



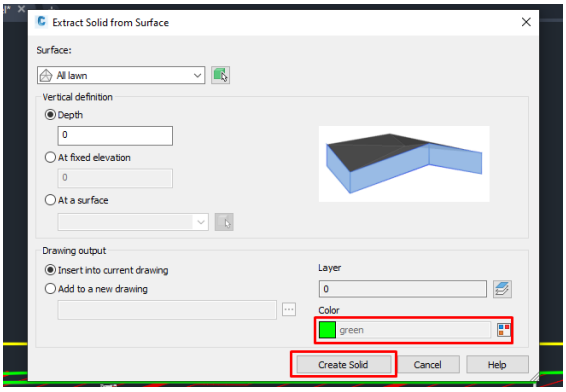


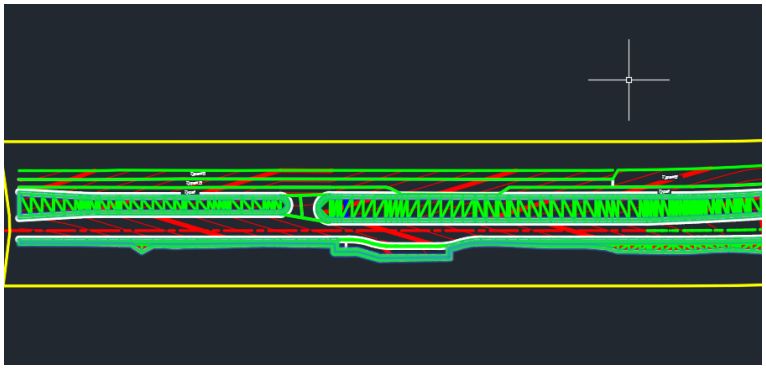
4. Toolspace=>Surfaces=>Select the “All lawn” surface=>Ribbon=>Extract from surface=>Extract Solids from surface





In the “extract solid from surface” window adjust green color and press the “OK” button.





Select, copy and paste our lawn solid into the “My BIM-model” to get the final reulst.