

AS473666

# Coordinating Civil 3D and Revit with Shared Reference Points

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## Learning Objectives

- Understand how Civil 3D and Revit handle real world coordinates
- Use the Shared Reference Point Tool to import Revit Model into Civil 3D
- Leverage BIM360 and the Desktop Connector to Import Civil 3D Surfaces into Revit
- Set up a DWG to Import into Revit

## Description

Make manual site coordination a thing of the past. In this class we'll be going over how to coordinate a Revit model with a Civil 3D site. Using the Shared Reference Point tool, we'll walk through the setup so that our data is tied together and test it by importing Revit data into the Civil 3D site. Once we've confirmed that our data is tied together, we'll leverage BIM 360 and the Desktop App to convert our Civil 3D surface into topography that Revit can use. Lastly, we'll go over how to set up a Civil 3D DWG so that it imports properly into our Revit model. By the end of this class, we'll be able to send information back and forth between Revit and Civil 3D quickly and accurately.

## Speaker

Michael is a Designated Support Specialist that has been working at the Autodesk Boston Drydock office for a little over 5 and a half years. He earned his Bachelor's in Civil Engineering from Northeastern University where he specialized in Transportation. While at Northeastern, he worked as a surveyor for the Department of Public Works in Cambridge, and later at two large Civil Engineering firms that his team helps support in his current role. In his current role, Michael works with Enterprise Accounts to integrate the latest technology into their workflows while simultaneously ensuring they're receiving the support required to be successful. This is Michael's third time taking part in AU and the second time presenting.

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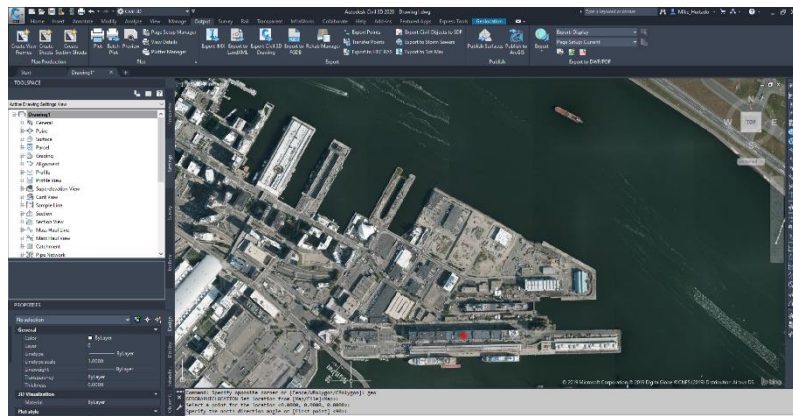
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## Understanding how Civil 3D and Revit handle Coordinate System

Revit and Civil 3D handle coordinate systems very differently. Revit is a powerful BIM tool where you're focusing on what's inside your building Civil 3D projects on the other hand heavily rely on making sure objects are georeferenced and comes preloaded with tools to help make sure this gets accomplished. With their different approaches to design, it can cause some headaches when collaborating between the two. Once we understand how each application handles coordinate systems, we'll have a better understanding of what we need to do to get our data coordinated and what tools we need to get it done. By the end of this demo we'll see that the process isn't all that daunting and we'll be comfortable coordinating between Civil 3D and Revit.

### Coordinate Systems in Civil 3D

Civil 3D comes preloaded with a vast library of coordinate systems and can handle data that is far away from the drawing origin. With this, we're able to design sites that are tied to its real-world location, or georeferenced. To serve as a reference tool, maps are provided by Bing and can be turned on when a coordinate system has been set. Civil 3D also includes a lot of Map 3D functionality in the Planning and Analysis workspace, but we won't be going over those for the purposes of this class.

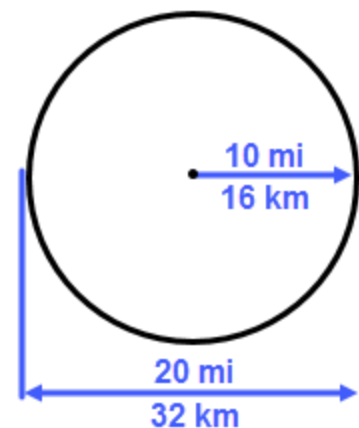


*Autodesk's Boston Office in Civil 3D*

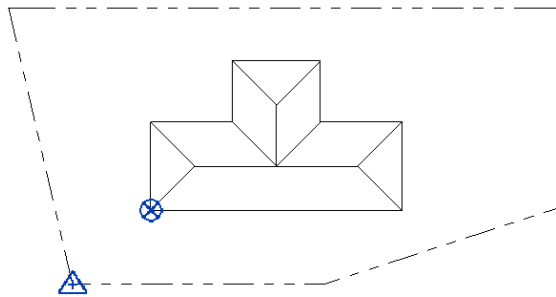
### Coordinate Systems in Revit

Revit doesn't come preloaded with coordinate systems like Civil 3D. On top of this, there are limitations on the size of your model. From the Revit help documentation:



"When you create a Revit model, you are working on a modeling work plane that is 20 miles or 32 kilometers in diameter, with a radius of 10 miles or 16 kilometers from the internal origin. All geometry for the model, including geometry from an import or a link, should reside within the limits of the modeling work plane."



In addition to this, any imported data that is further than this modeling plane will be distorted and will not display correctly.



*Project Base Point vs Survey Point*

To get around this, Revit has two separate points, the Project Base Point and the Survey Point. The Project Base Point by default is located at the center of the modeling work plane and can be used to help with measurements within the site. The Survey Point helps tie the model into a real-world location. The Project Base Point can be identified by the following icon  while the Survey Point looks like . It is important to note that both can be moved around our work plane.

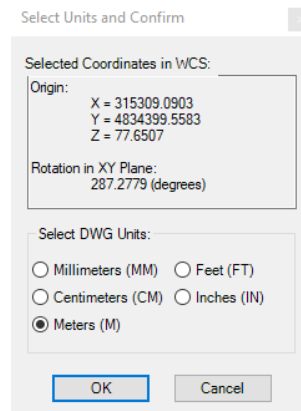
We'll be using the Survey Point to help tie the Revit model into the real world. While it is possible to manually do this, we'll be using a special tool to handle this for us.

## Tools available for Model Coordination

### Autodesk Shared Reference Point Tool

First up is the Autodesk Shared Reference Point tool. The Autodesk Shared Reference Point Tool first appeared in Autodesk Labs for the 2012 release of Civil 3D and Revit. It was then a part of the Productivity Tools for Civil 3D from 2013-2018. Since then it has been moved to the [Autodesk Account Page](#).

The tool takes the information from a point in Civil 3D and exports it to an XML file. The XML contains the following information:



Select Units and Confirm

Selected Coordinates in WCS:

Origin:

X = 315309.0903  
Y = 4834399.5583  
Z = 77.6507

Rotation in XY Plane:  
287.2779 (degrees)

Select DWG Units:

☐ Millimeters (MM) ☐ Feet (FT)  
☐ Centimeters (CM) ☐ Inches (IN)  
☒ Meters (M)

OK Cancel

This information is then used to move our Survey Point so that it matches up with our Civil 3D drawing. The site will then be tied to our Civil 3D DWG and we'll be able to send information back and forth between the applications.

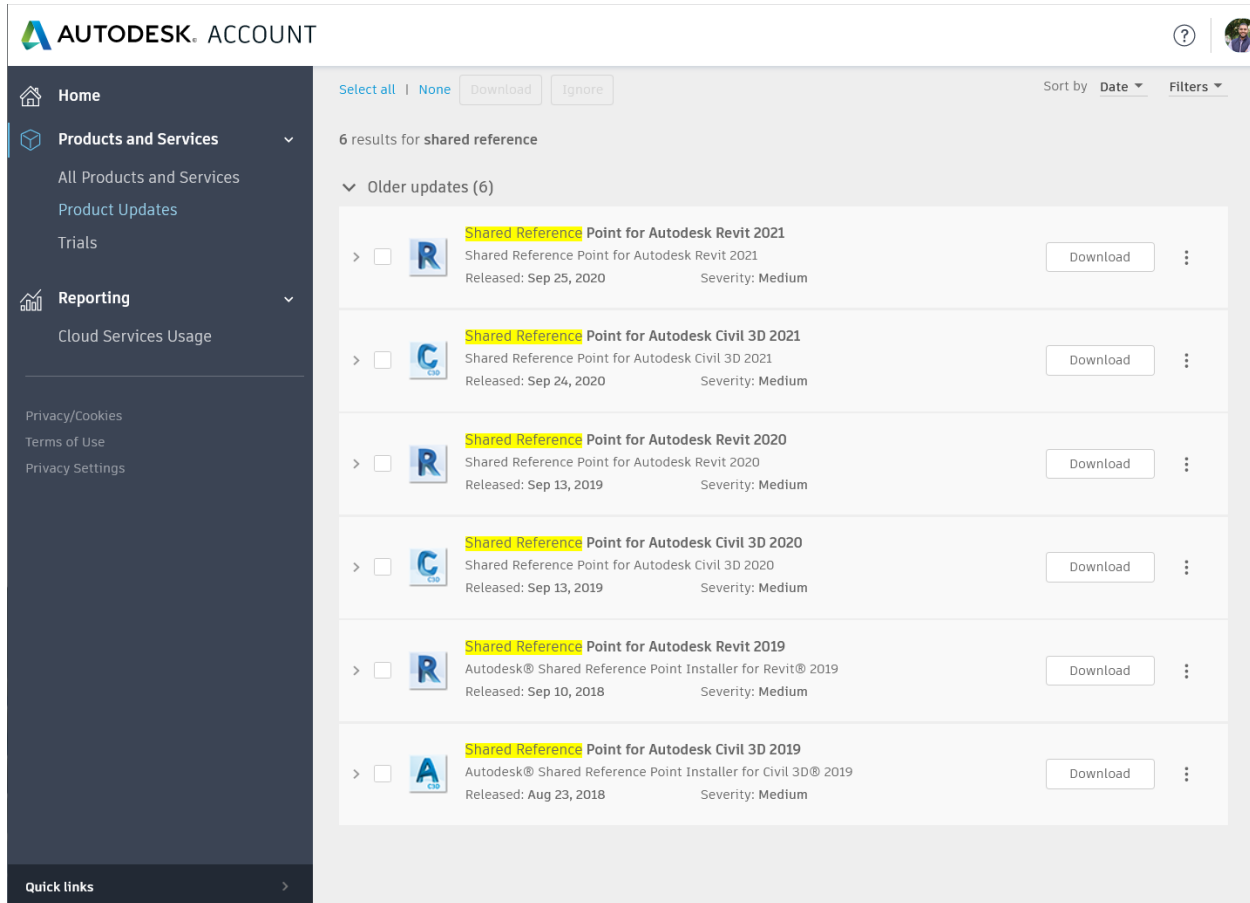
When downloading the Shared Reference Point Tool, it's important to note that there are two components; one for Civil 3D and one for Revit. The tools can be downloaded in the following location:

#### 2018 and Older

The Shared Reference Point Tool was included with the productivity Tools and can be found in the Autodesk Knowledge Network : [2015](#) / [2016](#) / [2017](#) / [2018](#)



## 2019 and Newer



The screenshot shows the Autodesk Account page with a sidebar on the left containing navigation links: Home, Products and Services (with sub-links for All Products and Services, Product Updates, and Trials), Reporting (with sub-link for Cloud Services Usage), Privacy/Cookies, Terms of Use, and Privacy Settings. The main content area displays a list of updates for the Shared Reference Point tool. At the top, there are buttons for 'Select all', 'None', 'Download', and 'Ignore', along with sorting options 'Sort by Date' and 'Filters'. The list shows 6 results for the shared reference point, categorized under 'Older updates (6)'. Each entry includes a product icon (R for Revit, C for Civil 3D), a title, a description, a release date, a severity level, and a 'Download' button.

Product	Update Title	Description	Released	Severity	Action
Revit	Shared Reference Point for Autodesk Revit 2021	Shared Reference Point for Autodesk Revit 2021	Sep 25, 2020	Medium	Download
Civil 3D	Shared Reference Point for Autodesk Civil 3D 2021	Shared Reference Point for Autodesk Civil 3D 2021	Sep 24, 2020	Medium	Download
Revit	Shared Reference Point for Autodesk Revit 2020	Shared Reference Point for Autodesk Revit 2020	Sep 13, 2019	Medium	Download
Civil 3D	Shared Reference Point for Autodesk Civil 3D 2020	Shared Reference Point for Autodesk Civil 3D 2020	Sep 13, 2019	Medium	Download
Revit	Shared Reference Point for Autodesk Revit 2019	Autodesk® Shared Reference Point Installer for Revit® 2019	Sep 10, 2018	Medium	Download
Civil 3D	Shared Reference Point for Autodesk Civil 3D 2019	Autodesk® Shared Reference Point Installer for Civil 3D® 2019	Aug 23, 2018	Medium	Download

The Shared Reference Point Tool can be found on the [Autodesk Account Page](#). It can be found in the Updates and Add-ons section of each of the respective products, but can also be conveniently found in the Product Updates section:

## Publish Surface Command

The Publish Surface command is a newer tool that was introduced in the 2019.1 update for Civil 3D and Revit. This workflow leverages BIM 360 to convert a Civil 3D surface into topography that Revit can use. To make sure that our surface comes into Revit in the correct location, the Revit model will need to be properly coordinated with Civil 3D which will already have been taken care of thanks to the Shared Reference Point Tool.

To use this workflow, you'll need a BIM 360 Docs account as well as the Desktop Connector. The Desktop Connector can be downloaded from the Autodesk Knowledge Network:

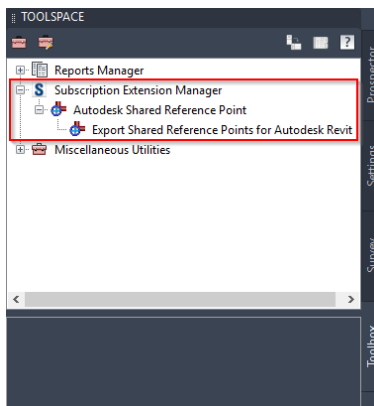
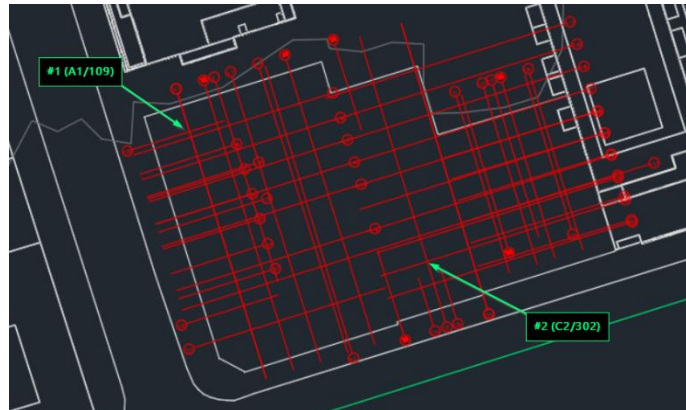
[Install Desktop Connector for BIM 360](#)

## Using the Shared Reference Point Tool to import Revit models into Civil 3D

Since we now know that setting up the Survey Point is the first order of business when it comes to model coordination, let's dive into how to use the Shared Reference Point Tool.

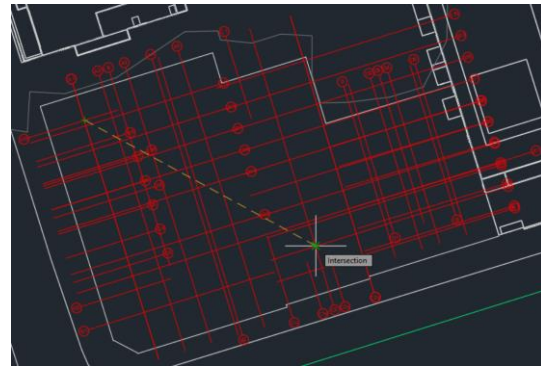
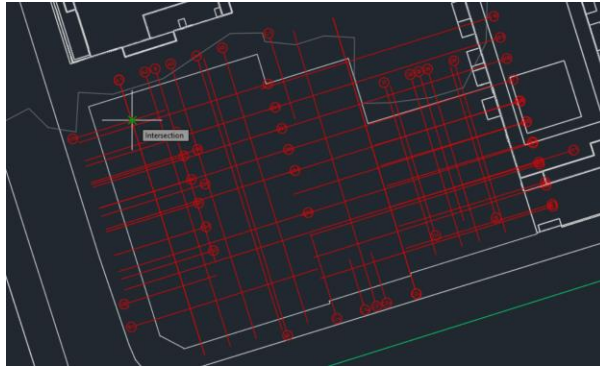
### Step 1 : Exporting Shared Reference Point from Civil 3D

- 1.1 Before jumping into the tool, we're going to want to make sure that we have two points in Civil 3D and Revit that can use as reference. The two points will need to be at the same elevation and will also need to be selectable in both Civil 3D and Revit. As long as these conditions are met, any two points will do. For this class, we're going to take advantage of a grid that has been laid out. This will help ensure that we're selecting the same points, in the same order, and at the same elevation in both Civil 3D and Revit. If the points are selected in the wrong order, you run the risk of your model coming in rotated 180°. Selecting the correct elevation can also be tricky because in most cases there will be points shared across multiple levels in our Revit model which can easily cause our data to be linked at the wrong elevation. The grid method avoids this and makes communicating with other teams easier as well.



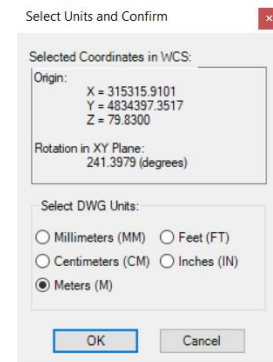
- 1.2 Access the Shared Reference Point Tool in Toolspace > Toolbox > Subscription Extension Manager. In Civil 3D, you'll only have the option to **Export Shared Reference Points for Autodesk Revit**.

- 1.3 Select your two points in Civil 3D. Remember the order that you pick them in! For this demo, I selected A1/109 as my first point and C2/302 as my second point.



1.4 Once the second point is selected, a window will pop up confirming the coordinates, elevation, and an option to pick units will pop up. If you have the information for the XYZ points, this would be a good time to double check that everything is ok. This data set is located in Canada so the DWG Units and Revit Units are in Meters (M).


1.5 Select OK and choose a save location for the XML file. Remember where this is saved as we'll need to import it into Revit.

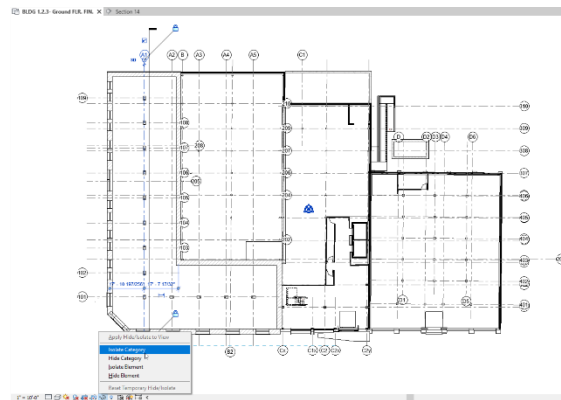


## Step 2 : Import XML from Shared Reference Point into Revit

The next step is to Import the data from the XML into Revit. To ensure this process goes smoothly with the grid method, isolate the Grid in the Revit Model and then import the XML.

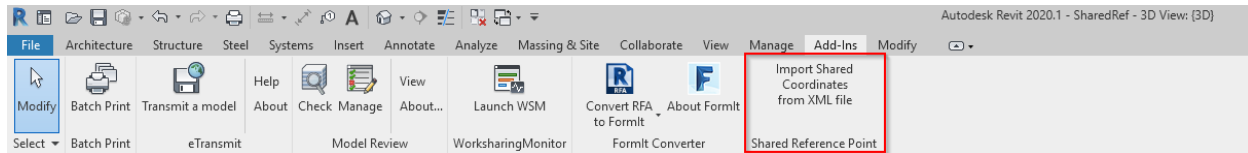
2.1 In the Project Browser, head to Floor Plan/ Flor Plan:BLDG 1,2,3- Ground FLR, FIN.

2.2 Select one of the grids and in the View Control Bar, select  (Temporary Hide/Isolate) and select **Isolate Category**.

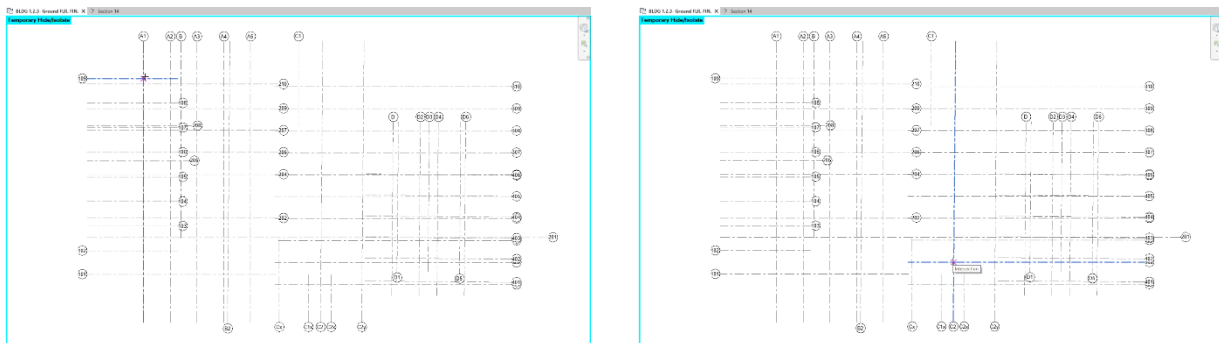




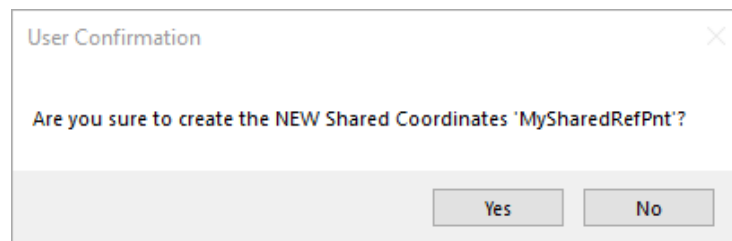
## 2.3 Head over to the Revit Toolbar > Add-Ins > **Import Shared Coordinates from XML File**




2.4 You'll be prompted to select the same two point that were previously selected in Civil 3D. Again, make sure that you're picking the same points in your Revit model and in the same order. Once again those points are A1/109 and C2/302

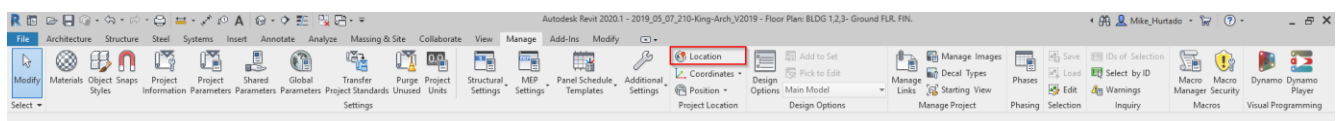


2.5 Once the second point is selected, you'll be prompted to import the XML file that was created in Civil 3D. Select the XML and a pop up will appear asking if you'd like to create Shared Coordinates. Select **Yes**.

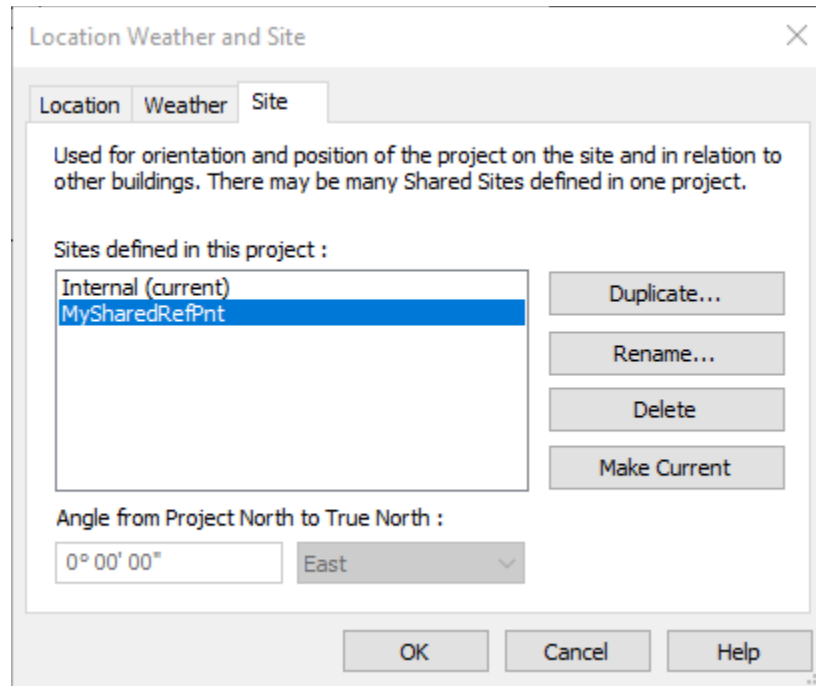


At this point you can end the Temporary Hide/Isolate by going to  and selecting **Reset Temporary Hide/Isolate**

2.6 A new site is created in the drawing where the Survey Point is updated. We aren't automatically updated to the new site, so we'll need to do it manually. In the Revit Toolbar > **Manage > Location**



2.7 A new site name “MySharedRefPnt” will be available. Highlight the site and select Make Current to update your Survey Point.

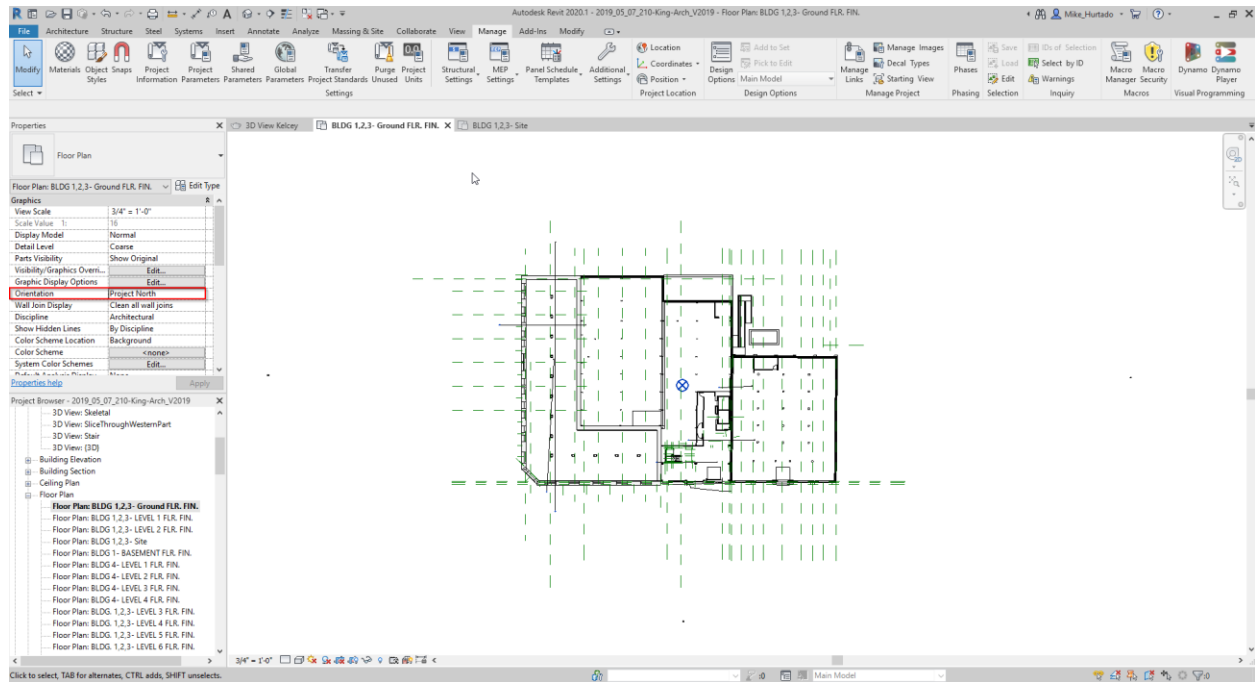


And with that our Revit project is now linked to our Civil 3D site! Sadly, there aren't any visual cues to let us know that the models properly coordinated which takes us to our next step.

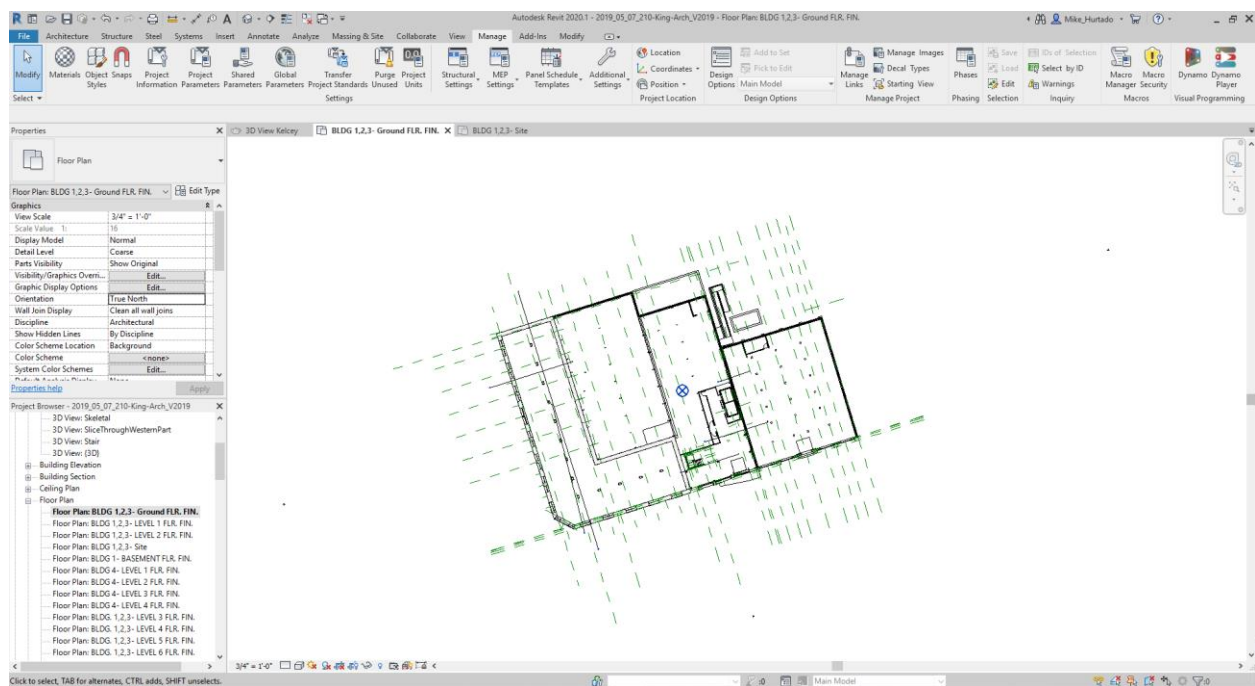
Tip: The site is named after the XML file. If you import an XML file with the same name, Revit will prompt you to overwrite the existing site. Alternatively, you can also change the name of the XML and have multiple sites in your Revit drawing.

2.8 Test if the Shared Reference Point Tool worked by checking the orientation of the model. In Revit properties, toggle the **Orientation to True North** and it should orient the same way that it is in Civil 3D.

Before:




After:

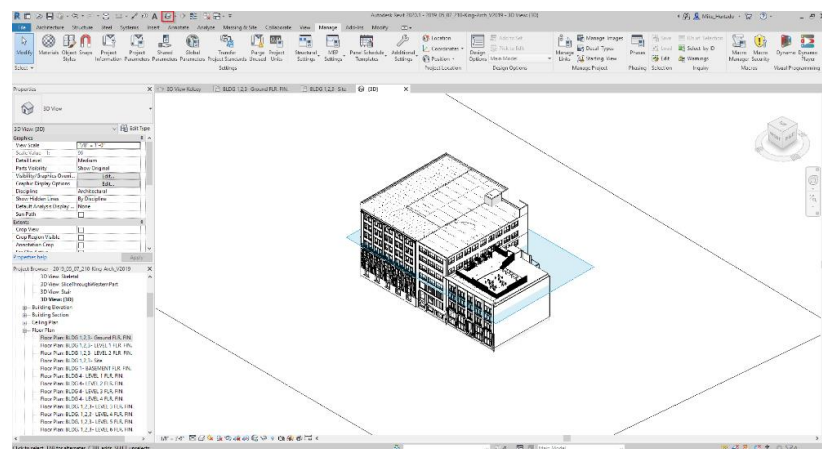


The Revit model should rotate to match what you're seeing in Civil 3D. If it rotates properly, then it's a good sign that our Shared Reference Point worked. We can move on and try importing our Revit model into Civil 3D.

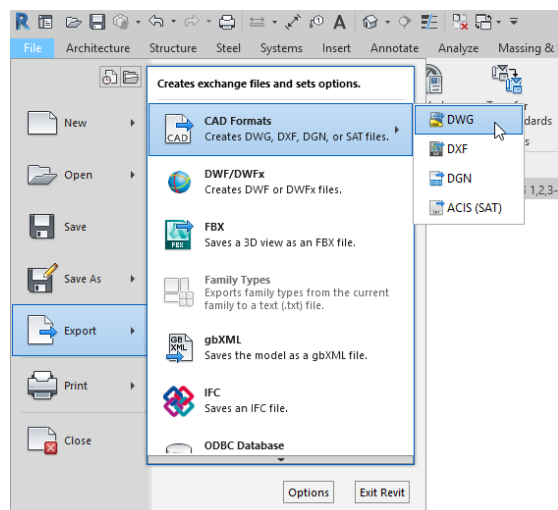
### Step 3 : Importing Revit Model into Civil 3D

We're going to try exporting a 3D model of Revit and have it land in our Civil 3D site without having to make any adjustments.

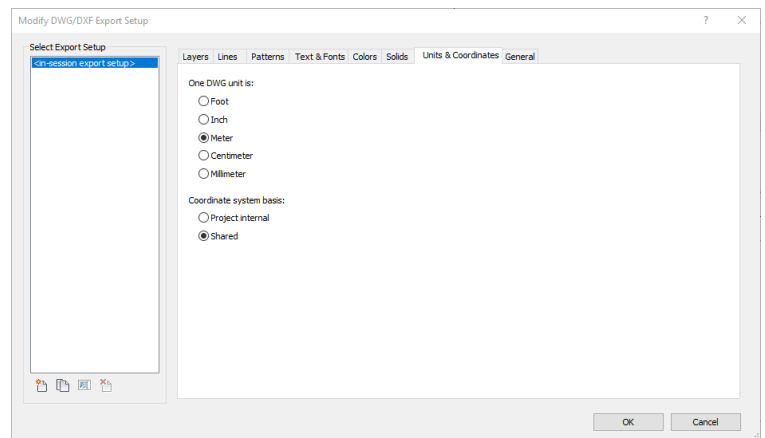
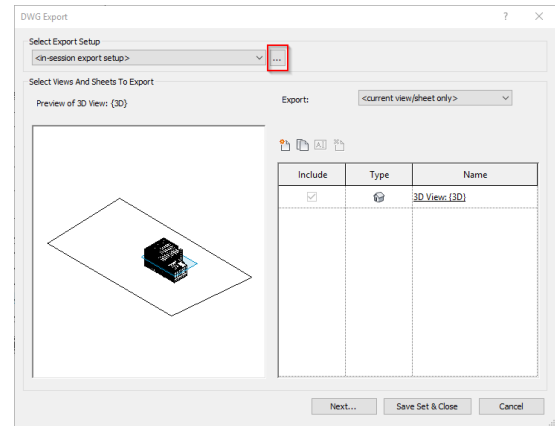
3.1 To export a 3D model of Revit, press the  **Default 3D View** toggle



3.2 Select the Revit icon > Export > Cad Format > **DWG**

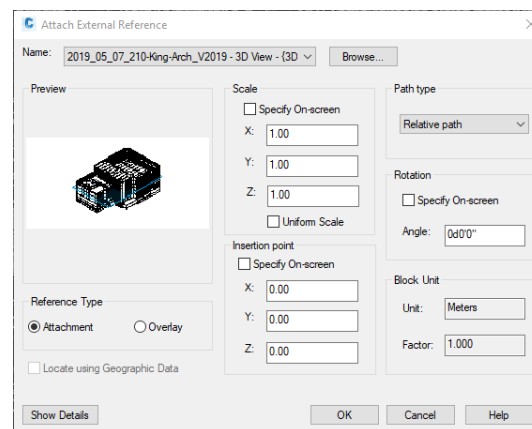


3.3 A few settings need to be tweaked for the Revit export to be coordinated with our Civil 3D DWG. Under the Modify DWG/DXF Export Setup dialog, make sure the correct units are set and that we're using the Shared Coordinate **NOT** the Project Internal Coordinate Base.



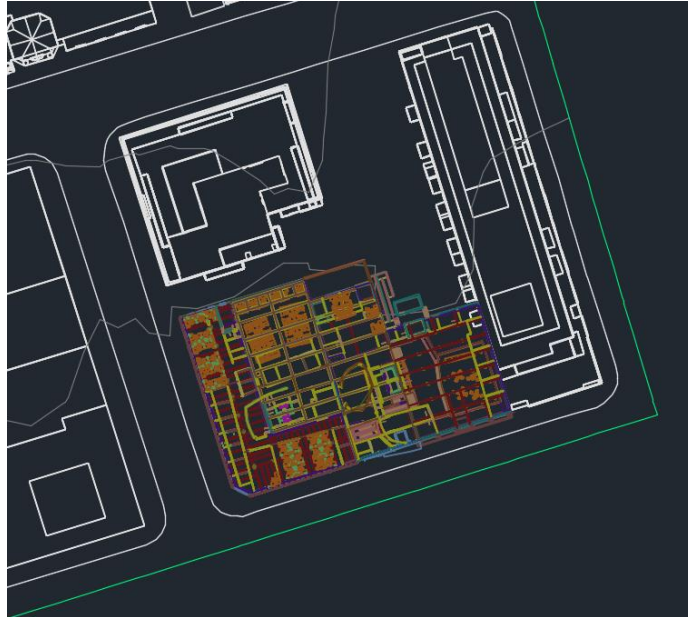
3.4 Once all the settings are correct, select **OK** and then **Next...** to save your DWG.

3.5 Back in our Civil 3D drawing, XREF the newly created DWG with all the settings. You'll want the Insertion Point to be 0,0,0 and select **OK**

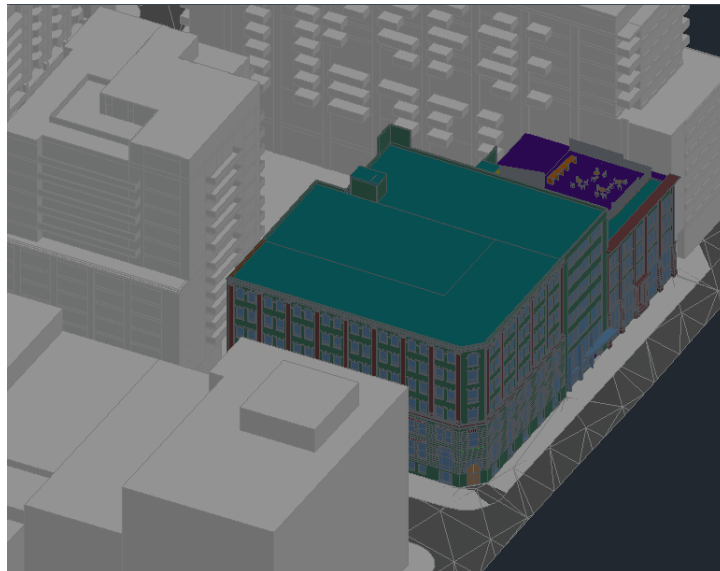




Our building footprint should now show additional detail that was imported from our Revit model. We've managed to successfully import our Revit data into Civil 3D without the need to manually modify it!



Now is also a good time to check if the elevation is correct in a 3D View in Civil 3D.



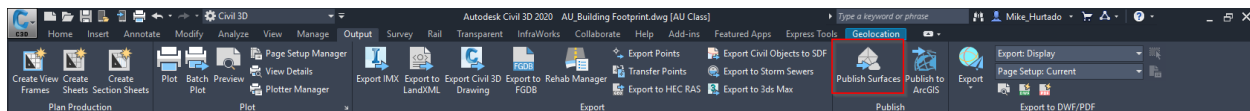
With everything looking good, let's move on to the next step.

## Using the Publish Surface Command to import Civil 3D Surface as Revit Topography

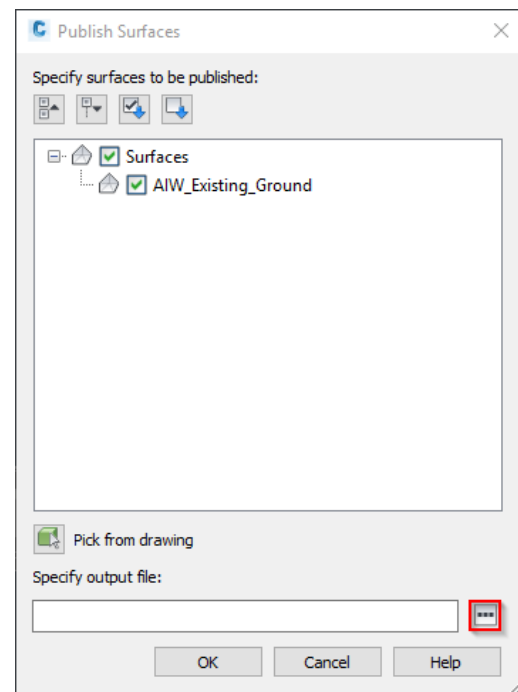
Now that we've managed to export our Revit model into Civil 3D, let's try going in the other direction. This is where the Publish Surface command comes into play.

### Step 4: Using the Publish Surface Command from Civil 3D

#### 4.1 The Publish Surface command can be found in the Civil 3D Ribbon > Output > **Publish Surface**



4.2 Select the surfaces for export and specify the location of the output file. Thanks to the Desktop Connector, your BIM 360 projects will be accessible via Windows Explorer. **Do not save locally.** You'll need to save it in a BIM 360 folder so that it is converted into topography that Revit can use. An important thing to note here, one file will be created each time you Publish Surface. Keep this in mind if you want to exclude surfaces or create separate files for each surface.



4.3 You'll have to wait for the output file to be generated. If using an outdated version of desktop connector, a notification will pop up in the system tray saying:

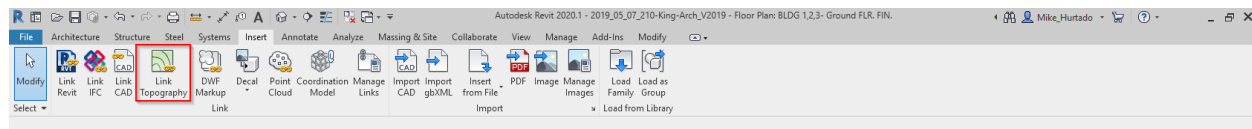
*"The file and any associated files will be uploaded when you close this session"*

You'll need to close Civil 3D completely for the file to start uploading. This step is crucial as it will allow the surface to be processed in BIM 360 and converted into a format that Revit can read. If you try to import the file into Revit before it is uploaded to BIM 360, it'll show up in

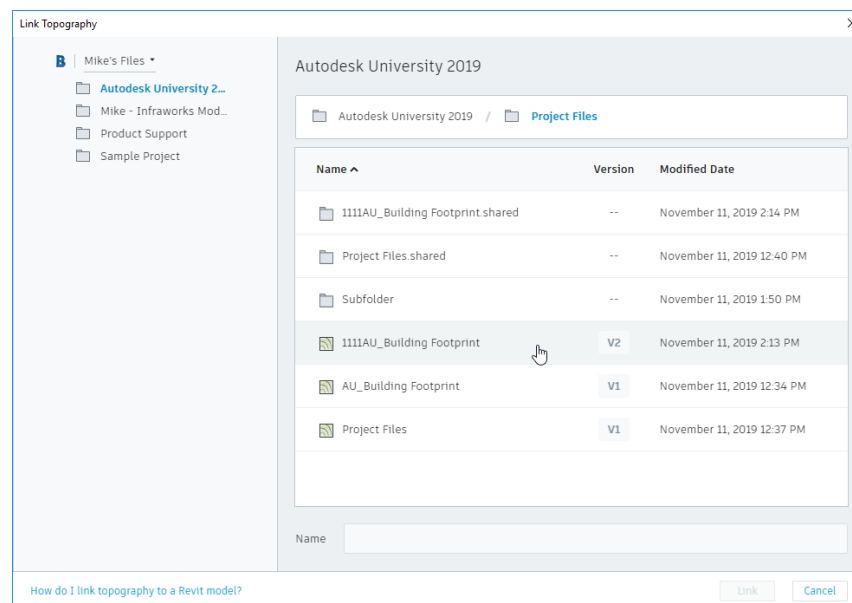
Windows Explorer, but it will produce an error when importing into Revit. To avoid this, update to the latest version of Desktop Connector.

## Step 5: Importing the Surface into Revit

5.1 With the surface published and on BIM 360, all that's left is to link it into Revit. The Link Topography tool can be found in the Revit Toolbar > Insert > **Link Topography**

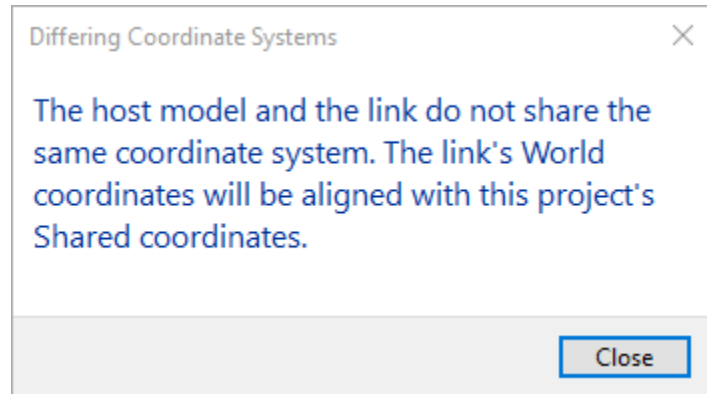


5.2 A Link Topography window will pop up that pulls information from your local BIM 360 cache. Select the file that was created in Civil 3D (ignore the .shared folder) and select **Link**.

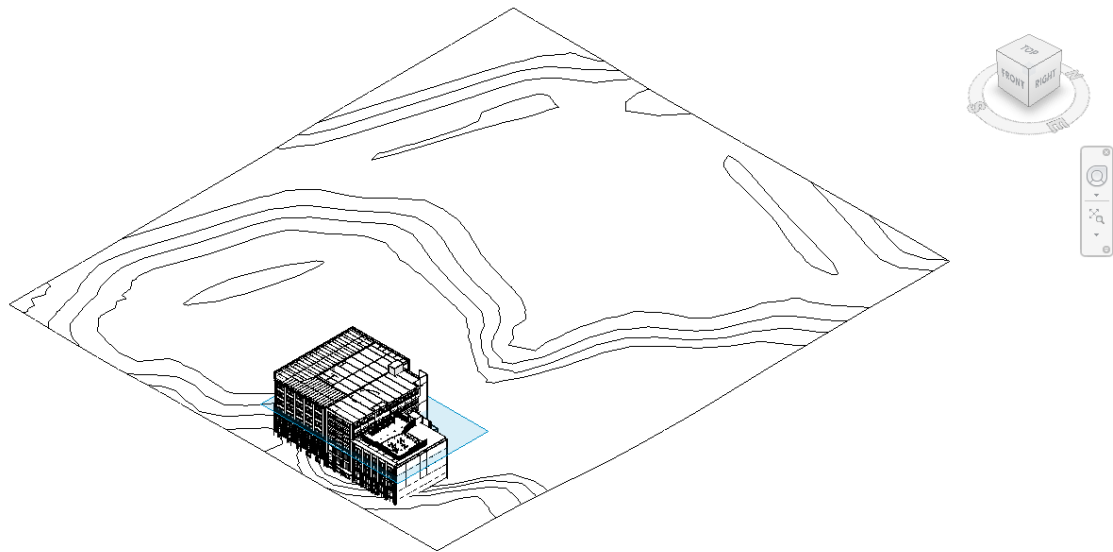


If you get any error messages, or if the file isn't showing up, check the [BIM 360 Docs web page](#) to see if it uploaded properly.

5.3 You'll get a message saying that the coordinate systems don't match, but this can be ignored. Select **Close**.



5.4 Depending on which view you're in, you may not be able to see your topography. Switch over to a 3D view and double check that everything came in correctly:



Topography Linked in Revit

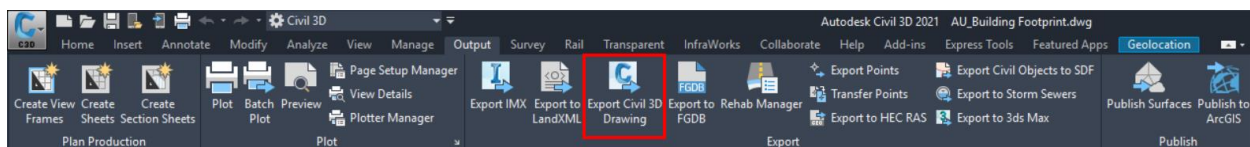
Congratulations! Your topography is now linked into your Revit model. Since the surface is linked, if any changes are made to the Civil 3D surface and republished, the versioning will be updated in BIM 360 Docs and you'll see the changes in your Revit model. This has the added benefit of allowing you to revert back to a previous version of the topography if unintended changes are made.

## Setting up a DWG to import into Revit

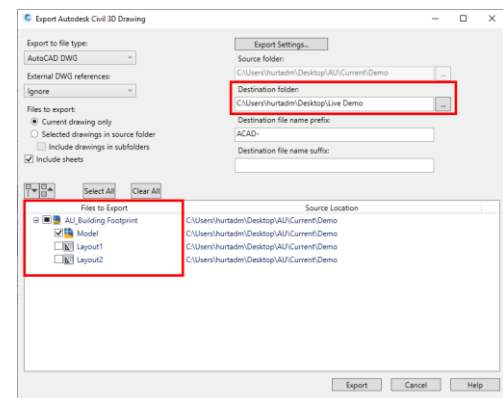
The last thing missing is to be able to import the Civil 3D linework into Revit. Simply importing the DWG into Revit won't work and that is what we will cover in this last section. We will first need to export our Civil 3D DWG into a vanilla AutoCAD DWG, and then tweak our setting in Revit for the linework to land in the correct location.

### Step 6: Importing the Civil 3D Linework into our Revit model

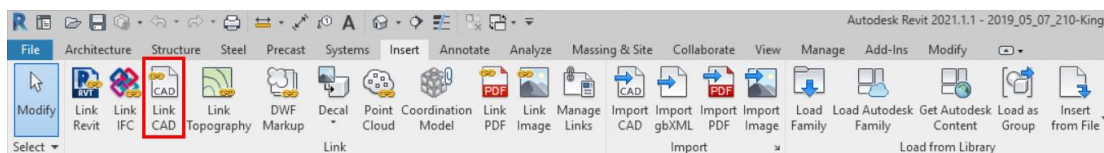
6.1 For this to work, you'll need to use the **Export AutoCAD Civil 3D Drawing** command. You can do this in the Ribbon > Output Tab or by entering **EXPORTC3DDRAWING** in the command line.



6.2 In the Export Autodesk Civil 3D Drawing dialog box, most of the defaults will work for our purposed. For this demo, the most important options to take note of is the destination folder and that we're only selecting Model under Files to Export. Once all the settings are in place, select **Export**.



6.3 Back in Revit, go to Insert Tab in the Ribbon and select **Link CAD**



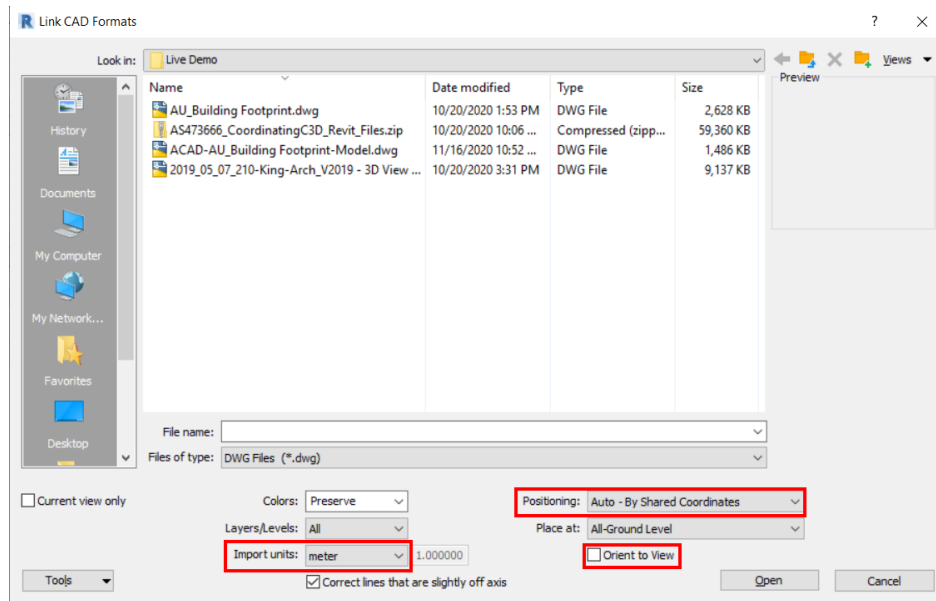
6.4 The Link CAD Formats window will pop up. Make sure that you select the options BEFORE selecting the .dwg to link. The main settings to set correctly are

Positioning: Auto – By Shared Coordinate

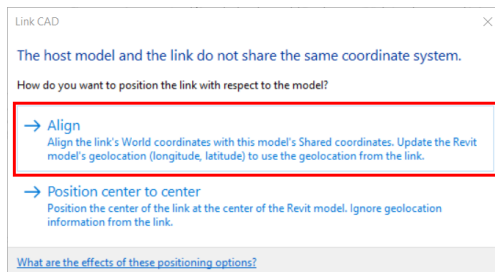
Units – Will be automatically detected but doesn't hurt to set to correct units.



Orient to View- Make sure it is not selected. If Orient to View is selected and your Orientation is set to True North, the linework will come in oriented to Project North and your linework will not import correctly.



6.5 A Link CAD dialog box will appear stating that the host model and the link do share the same coordinate system. Select **Align** and the linework will land in the correct location. If you aren't seeing the CAD linework, make sure that your Visibility/Graphics Overrides display imported categories. If you can see the CAD linework, but none of your Revit linework, it could be that your Revit linework is located below the CAD linework; this occurs in the model if you try the Floor Plan: BLDG 1,2,3- Ground FLR. FIN which is below the surface.



And that is it! Our CAD linework is now imported in the right location in our Revit model. If any changes happen to the Civil 3D DWG, simply re-export the updated linework. Revit will read the link and automatically drop the linework in the correct location.

## Common Issues

### Can't select second point with Shared Reference Point Tool

An error will normally pop up in the command line saying the following:

“Selected Point has a different WCS Elevation to Origin – please try again...”

To resolve this, you'll need to make sure that the elevation of the second point matches that of the first.

### Exported Revit Model very far from Civil 3D site

There are a couple possible causes for this:

- 1) Mismatching units in Revit and Civil 3D model. Make sure that the Revit model units match those of the INSUNITS in Civil 3D.

--OR--

- 2) Exported Revit isn't using shared coordinate system.

### Model shifts a bit in X or Y plane in Civil 3D

If a model comes in a little off in Civil 3D, it may be due to the difference between US Survey Feet and International Feet. The conversion between the two is:

.999998 US Survey Feet = 1 International Foot

Revit doesn't support US Survey Foot and when we're talking about building design it doesn't make a big difference. When we're talking about georeferencing however, this can lead to data this is slightly off. To work around it, set [INSUNITS](#) in Civil 3D to **2** for International Feet.

### Model shifts in Z plane in Civil 3D

The elevation is based off the first point selected with the Shared Reference Tool. Make sure:

- 1) Your point is on the correct surface in Civil 3D (i.e. don't pick the existing surface if your design surface is going to be at a different elevation)
- 2) You're selecting the correct point in Revit. Make sure the floor plan that you're selecting is at the correct level.

**“Failed to link the topography through Autodesk Desktop Connector. Please try again later.”**

The most common cause of this issue is that the surface hasn't been processed in BIM360. In older versions of the Desktop Connector, files wouldn't upload to BIM360 until Civil 3D was closed. Either close out of Civil 3D or update the Desktop Connector to get around this issue. Check the [BIM 360 Docs web page](#) to make sure that the file has been properly uploaded. Once it shows up in the web page, then try to Link Topography in Revit.

### **CAD linework is missing**

There are a few possible causes for this one. If you've been able to verify that the Revit export works, then make sure that you're:

- 1) Using the Export AutoCAD Civil 3D Drawing option. Using EXPORTTOAUTOCAD or one of the other legacy export tools will not work
- 2) Your settings on import are set correctly. The most common causes are incorrect Positioning and/or Units
- 3) Make sure that Imported Categories are shown in your view

### **Revit linework is missing**

The CAD linework is showing up just fine but the Revit linework that was there no longer appears. This happens because the CAD linework is on top and covering the Revit linework. If the CAD linework is displaying at a higher elevation than expected, check to make sure that the Shared Reference Points share the same elevation. In some instances, Architects intentionally alter the overall elevation of their structures. If this occurs, manually edit the exported XML to reflect the change.

## Helpful Links

[Revit: About the Maximum Distance](#)

[Revit: About Base Point and Survey Point](#)

[Link Topography to the Building Model](#)

[Civil 3D: About GIS Coordinate Systems](#)

[Two Right Feet? U.S. Survey Feet vs. International Feet](#)