

## **AutoCAD® Civil 3D® to Autodesk® Revit® and Back**

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### **AB3729**

AutoCAD Civil 3D and Autodesk Revit software are two of the most advanced BIM applications available to users. Both programs offer cutting edge features that elevate the capabilities of modern day design and documentation. Alone these application are the head of their class but together they could be the integrated solution that the AEC industry has been looking for. Although importing a topographic map into Revit is a simple task, day-to-day coordination of these two disciplines can be frustrating. In this class, we will demonstrate the important benefits that come with coordinating these two disciplines. Furthermore, we will explore a wide variety of working scenarios that will assist in managing the integration of CIVIL 3D and Revit.

### **Learning Objectives**

At the conclusion of this class, you will be able to:

- Utilize multiple methods for importing and exporting data from both Autodesk Revit and AutoCAD Civil 3D.
- Collaborate with multiple types of AutoCAD Civil 3D files in Autodesk Revit..
- Manage shared coordinates between AutoCAD Civil 3D and Autodesk Revit.
- Actively link data between both AutoCAD Civil 3D and Autodesk Revit.
- Manage coordination with collaboration software like Autodesk Navisworks and Autodesk Infrastructure Modeler.

### **About the Speaker**

Brandon Serves as the Chief Technology Officer and EDGE Global Technology Solutions where he oversees our companies technical operations. Brandon's experience stems from the construction industry, where he has worked in the areas of architecture, civil design, interior design, and computer animation. He utilizes a variety of architectural software applications in multiple disciplines including design development, construction documentation, 3d visualization, cost estimation, quantity take-offs, and surveying. Brandon's possesses a special ability to communicate and interact with a variety of professionals and trades. His outgoing personality helps to provide a comprehensive and enjoyable experience while increasing our clients' knowledge base. Brandon also shares his expertise in the integration of multiple software platforms across a wide range of industries. Brandon contributes by maximizing the productivity of an office and ensuring that the best tools available support the most appropriate work flow of an organization.

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## Introduction

I am not a Civil Engineer or an Architect, in fact I have spent the majority of my career in the construction industry where I have often been tasked to assist in the coordination and collaboration of construction documentation. The process for coordination between the three flavors of Revit has been heavily documented. However, the civil engineers I work with are often times left to fend for themselves when it comes to coordination of their models. Furthermore, the coordination between those using Revit and Civil 3D are often riddled with complicated work arounds.

This class was a challenge for me, not because it was filled with complicated procedures and workflows, but rather a great deal of research in the current methods of coordination. As we will discuss throughout the presentation there are hundreds of scenarios that will present a variety of challenges in the coordination of AutoCAD Civil 3D and Autodesk Revit. It is the goal of this class to outline several common scenarios and the various procedures that can assist in resolving them.

We'll start by covering the basic aspects of collaboration which will include importing and exporting from both AutoCAD Civil 3D and Autodesk Revit. From there we will learn multiple methods in managing shared coordinates between both applications.

To conclude the session we will review multiple scenarios that could present several complicated issues. We'll also review how we can manage these issues with external applications that will provide additional coordination options.

## Project Kickoff – NOW WHAT!!!!

The start of every project comes with a slew of questions, budget meetings, site variances, RFI Requests, and who knows what else. Who has time to perfect the proper coordination of BIM deliverables? The answer is pretty simple, "NO ONE." In fact, most times the coordination procedures evolve along with the project. What is crucial is to have a direction and more importantly a collaborative relationship with all documenting designers and engineers. Consider these items before defining your exact procedure.

- Who will be hosting the models and or digital documentation? Furthermore, when, where, and how often will information be exchanged?
- Which disciplines will coordination be required, and what are the tolerances?
- Which Discipline is kicking the project off? This is probably the most crucial question, because as you will see with the various scenarios whoever starts first will dictate the direction of coordination for modeled information.
- Finally, what applications will each discipline be utilizing and what external applications do they have access to?

## Autodesk Revit to AutoCAD Civil 3D

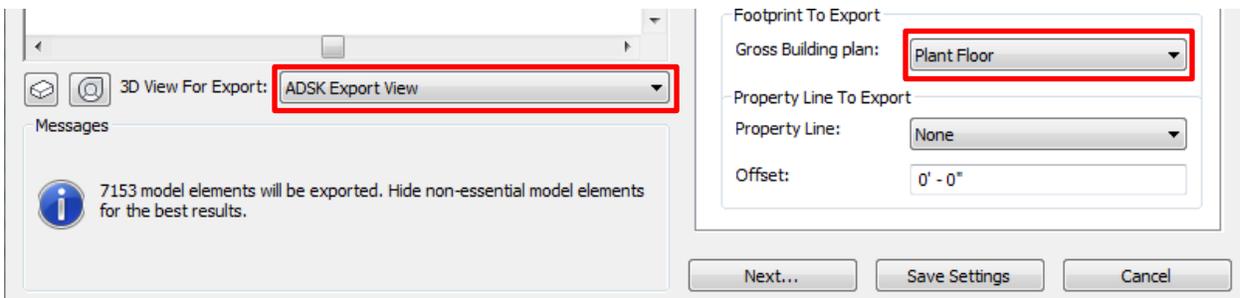
**Scenario 1:** Architect is looking to transfer Revit Model to Civil Engineer for development.

This is the most typical and basic procedure in transferring information between Autodesk Revit and AutoCAD Civil 3d. Fortunately this process comes with very little complication however; the output data may not be ideal and may require additional modification.

Below is a documented procedure for exporting the 3D Model from Autodesk Revit:

### Step 1: Export to Civil 3D

1. Start by creating a 3D view in Revit that is specifically used for the ADSK file export function. This is because the ADSK export function exports a 3D View.
  - *Tip: Anything visible in the 3D file will be included in the ADSK file. Use visibility graphics to reduce the amount of information exported in the ADSK file.*
2. Next ensure that a *Gross Building Area Plan* has been created. This Plan is required because it serves as the building footprint once the ADSK file has been imported into Civil 3D.
  - *Tip: The Gross Building Area Plan should be created on the floor that best represents the building footprint.*
3. Next Navigate to the **Application Menu > Export > Building Site**. When the Building Site Dialog Prompts select the desired 3D View for Export.



4. Once you have optimized those settings you can navigate to the Project information tab or the site tab for further customization. We will explore configuring the site location later in this demonstration. Before hitting next it may be a good idea to save your settings this way it will be easier to quickly export update models for the Civil Engineer. Select **NEXT**.
5. Save your ADSK File to the appropriate location.
6. You will notice that once the export is complete an **Export Building Site Report** will prompt in your Internet Browser with detailed information from your exported model.

**(Note this process was done using REVIT 2013 but is similar to 2012-2010)**

Below is a documented procedure for importing the 3D Model into AutoCAD Civil 3D:

### **Step 2: Import ADSK in Civil 3D**

1. Navigate to AutoCAD Civil 3d and go to the **Insert** tab of the Ribbon. Below the Import panel select **Import Building and Site**.
2. The Import Building Site Dialog box will be prompted. The first option in the dialog box prompts you to select the ADSK file you wish to Import. Locate the file that you just exported from Autodesk Revit.
3. A Preview of your structure will display, also notice that your 3D view cube is available in the upper right corner of the display box if you wish to rotate the view. Select **NEXT**.
4. You will then be prompted to confirm the desired import units. These have been configured based off your Revit model. Select **NEXT**.
  - *Tip: In order to modify the building and site units you must make adaptation to the original Revit model. Select Next*
5. You will then be prompted to modify Display Properties. It is here that you will specify a Layer and the display style of your imported model. Select **NEXT**.
6. Finally, you will be prompted to specify your insertion point. Depending on how the Revit file was configured it may or may not be acceptable to use the default settings. Select **FINISH**.
  - *Tip: We will cover the synchronization of project location later in the article.*
7. You will notice that a single square grip becomes available. This signifies the building site location. If + symbols are present they represent utility connections. These cannot be moved but can be snapped to when laying out utilities in Civil 3D.
8. In the Toolspace, on the Prospector tab, the building Sites collection displays the building site object that was imported.
9. Depending on how your visibility graphics were configured during the export of the ADSK file Utility connection, roof, door, and other Revit data is visible under the building site object selection.

***(Note this process was done using CIVIL 3D 2013 but is similar to 2012-2010)***

This simple process is the foundation for exporting from Revit to Civil 3D. It is vital that ADSK file format be used in place of the typical DWG exporter in Revit. The ADSK file contains a great deal of information that adds functionality and performance to the Civil 3D file.

With that said there are still several issues that need to be addressed in the Export and Import process. These issues are critical in resolving the scenarios we will cover moving forward.

- Exporting a Site model from Civil 3D to Revit.
- Managing Shared Points of Origin and Shared coordinates.
- Managing updates to both the AutoCAD Civil 3D file and the Autodesk Revit file.
- Collaboration and Coordination through external applications.

## AutoCAD Civil 3D to Autodesk Revit

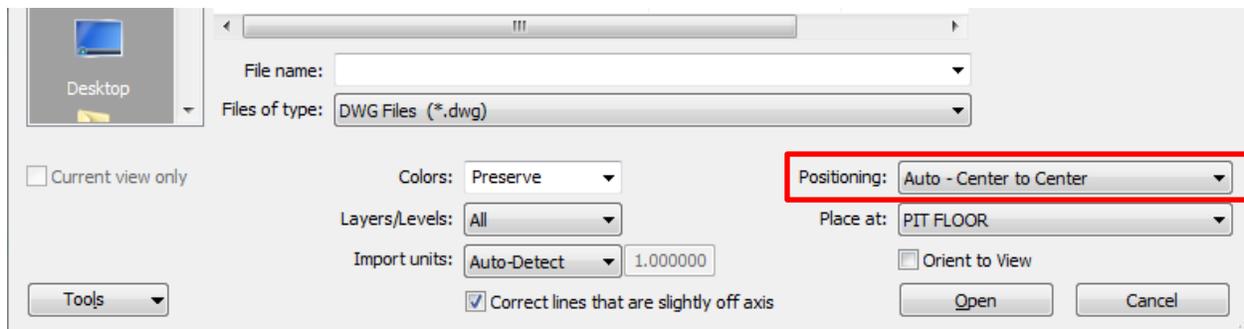
**Scenario 2:** *The Civil Engineer is ready to transfer a completed site plan for the Architectural model. The model then needs to be utilized by Architect within the Revit Model.*

This process presents some minor complications related to the data that has been exported from Civil 3d. More specifically, the way in which the site was modeled and how the Architect intends on utilizing the data.

Below is a documented procedure for exporting the 3D Model from AutoCAD Civil 3D:

### Step 1: Export to Revit

1. Before sending the Civil file you need to set a system variable in Civil 3D so that Revit Architecture can read all the Civil Data. Setting **proxygraphics** equal to 1 in Civil 3D and then saving the drawing.
2. Revit does not except an ADSK file like Civil 3D so an export process is not required. Simply navigate to the insert tab on the ribbon and link the Civil 3D DWG. Into your revit model.
  - *Tip: Linking a DWG. File of any kind requires some optimization. It is important to ensure that you specify the correct positioning. We will discuss these options further in the presentation.*



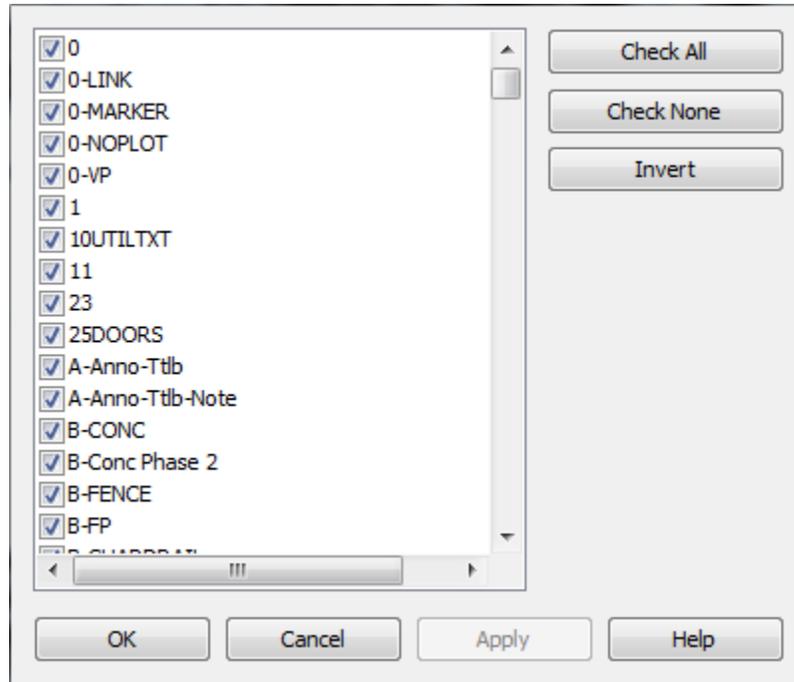
3. Once the file is linked you can either continue working as though the link is simply a background or you can create a topographic surface using the civil link.

Below is a documented procedure for creating a topo from a DWG. Link:

### Step 2: Creating a Topographic Surface from a DWG. Link

1. Navigate to the Massing and Site Tab on the Ribbon. From there select **Toposurface**. You will then be brought into sketch mode where you can begin developing your topo surface.
2. From your Edit Surface Contextual tab there is a tool called **Create from Import**. In the drop down find **Select Import Instance**. You can then select your link where you will be prompted to specify which layers represent the contour lines you would like modeled.

3. In reviewing your list find the contour lines that represent those that should be used to model your topo surface. Select only those layers and then select **OK**.



- *Tip: If you are unsure of the Line the represents your contours you can select your link and run a query to identify the layer name of the specific contour.*
4. Once the file has had time to process you should notice that points are placed at the contour lines representing the heights as indicated in the Civil 3D file.
    - *Tip: Before finishing the surface select **Simplify Surface**. This will reduce the number of points on the contour lines however will significantly improve performance.*

Now that we have a clear understanding of how Autodesk Revit and AutoCAD Civil 3D collaborate with one another we need to address the issue of coordination. While the above steps were fairly straight forward they did not take into account several critical components.

The first and most import of those components is the sharing and publishing of coordinates. While one would think this would be a seamless process that is often not the case. There are several methods we will examine in linking information together as well as some developmental applications that may be to answer in the very near future.

We also need to keep in mind the other outstanding issues mentioned above.

- Managing updates to both the AutoCAD Civil 3D file and the Autodesk Revit file.
- Collaboration and Coordination through external applications.

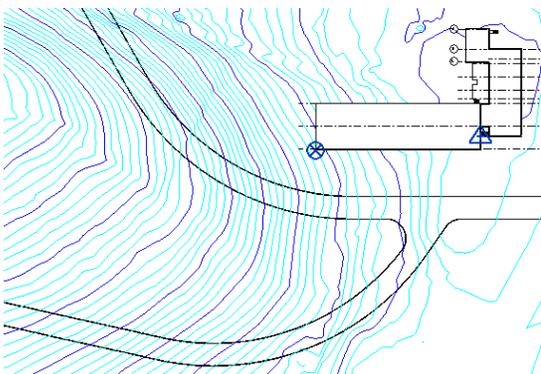
## Managing Shared Coordinates

**Scenario 3:** *The Architect would like to publish site coordinates that properly align the Revit model with the Civil 3D Site.*

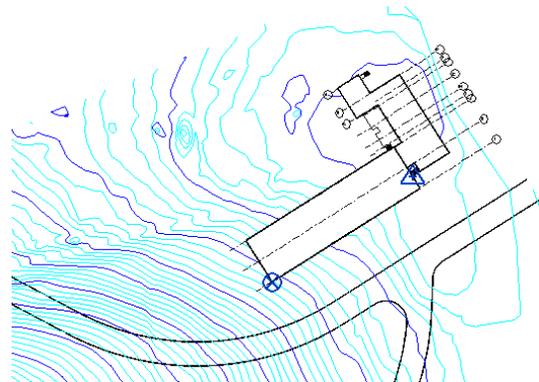
Regardless if you're trying to coordinate an architectural Revit model with MEP, Structure, or Civil, shared coordinates are a common point of confusion. Obviously if everyone starts from the same base point this presents little if any complications. However, it is common for Civil Engineers to begin site development prior to architectural coordinates being published. In these cases there are two course of action, manual or automated modifications. Both options will be demonstrated below.

Below is a documented procedure for manually coordinating a Revit Model with a Civil 3D Site:

1. The First Step is finding a common reference point that all parties have agreed to work from. This point will be used for referencing the base point of your model. Ideally at this point the Civil Engineer has established where the building will be located on the site.
2. Next we will link the Civil Site plan into Revit using the procedure found in Scenario 2 step 2. Once the site has been inserted we will manually move the site so that it aligns with our building. While this may seem a bit rudimentary the link has still retained its original location.
  - Tip: It is important that you do not move or rotate the building. Only adapt the site plan received from the civil engineer.
3. With step two complete navigate to the **Manage** Tab of the ribbon and Select **Acquire Coordinates**. Then Select the Linked Site plan.
4. Having completed step three you have successfully established both project and shared coordinates. To verify change your **Orientation** from Project North to True North in the **Properties** palette.



Project North



True North

5. Once the coordinates are properly aligned within Revit you can again export your model to an ADSK file as demonstrated in Scenario 1 Step 1.

## **Managing Shared Coordinates**

*Scenario 4: Using Autodesk Labs BIM Coordination tool the Architect and Civil Engineer would like to coordinates their models.*

Autodesk Labs has been working on developing an application that can streamline the procedure for coordinating models between applications. While BIM Coordination is far from a finished application it does offer a unique opportunity for those that are looking to experiment with a developing piece of technology.

*\*\*Please note this application is only for the 2012 product line\*\**

## **Share coordinate systems between AutoCAD Civil 3D and Revit**

### **OVERVIEW**

The effective organization of project data in shared or related coordinates is essential to effective collaboration across disciplines and good quality project information. BIM Coordinator for AutoCAD® Civil 3D® and Autodesk® Revit® software is a free\* technology preview that assists project team members with building and site grids.

### **BUILDING GRID**

Building grids are generally selected based on the layout and shape of the building, usually using the lower left corner of the selected orientation as a reference point. Building grids are established by the lead designer of a project for use by all members of the building design team. This grid ensures that different disciplines' building designs use the same reference for purposes of building analyses, drawing production, and other tasks requiring coordinated building data.

### **SITE GRID**

Site grids are generally based on Northing and Easting coordinates. They are usually established for a region; although arbitrary grids can be established for a single project or site. For example, in the UK most sites are related to the Ordnance Survey (OS) grid. Site elevations (levels) are also based on an OS benchmark or other site/project benchmark.

### **COORDINATION OF BUILDING AND SURVEYGRIDS**

BIM Coordinator for AutoCAD Civil 3D and Revit automates the more error-prone manual steps in the coordination of site and building grids between the AutoCAD and Revit environments. The tool specifies one common XYZ point and its orientation in the XY plane between the two coordinate systems. This reference point defines the relationship between the building and site grid.

Below is a documented procedure for using the BIM Coordination application:

1. Start by Downloading the BIM Coordination application from the Autodesk Labs Site:  
[http://labs.autodesk.com/utilities/bim\\_coordinator](http://labs.autodesk.com/utilities/bim_coordinator)
2. You will notice that once the application is properly installed that in the Revit Add Ins Tab you will find the new application available to you. The tool will also now be available in your Civil 3D Toolspace.
3. Navigate to Civil 3D and open the Model you are looking to coordinate. From there you will navigate to your Toolspace where you will find the BIM Coordination application. Select **Export Shared Coordinates** under **Revit Interoperability** and in the command line you will notice it prompts you to select a start point. Specify the Lower Left corner of your structure and then a parallel point along that same edge to ensure the rotation is correctly represented.
4. You will then be prompted by a dialog box which displays the shared coordinates based off of your selections. Specify the correct unit measure and select **OK**.
5. You will now be asked to name that shared coordinates file that you created. Once you have saved the file Open the Revit model that is being coordinated with the Site.
6. Once in Revit navigate to the Add-Ins tab and select the BIM Coordination tool that has been added to your ribbon. Once selected you need to reselect the same points that you picked in civil 3D to have a common frame of reference.
7. Once this has been completed you will be prompted to select the shared coordinates file that you saved out of civil 3D. Select the file and **Open**.
8. Once prompted that the Shared coordinate file was successfully imported navigate to the **Manage** Tab on the Ribbon. Select **Location** and then the **Site** tab. You will notice in the dialog box the coordinates system you published out of Civil 3D is available. Select and say **OK**.
9. Now using the verification technique Learned in the Previous Scenario adjust the Orientation of the view to ensure the changes have been adopted.
10. You can now also use the ADSK Export procedure to insert the Revit model directly into AutoCAD Civil 3D



## ***Conclusion***

In conclusion I think it is pretty safe to say there are many different way to get Autodesk Revit and AutoCAD Civil 3D to work harder for us. While the collaboration tools are constantly evolving there are reliable procedures out there that can assist in making interoperability a streamlined work flow. It is my hope that you have gathered several different approaches to collaboration in this course and that you will be able to successfully adapt the technology to work for you and your firm.

Thank you for attending this course and for more tips and tricks, refer to my blog.

THE CUTTING EDGE, at [WWW.EDGE-GTS.COM](http://WWW.EDGE-GTS.COM)

Thanks for attending!!