CES466206

BIM 360 Design - Revit \ Civil 3D Collaboration

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Learning Objectives

- Understand the nature of design collaboration within BIM 360.
- Experience the cloud worksharing in Revit through BIM 360 Design.
- Understand how Civil 3D design sharing with Data Shortcuts and Xrefs can occur through BIM 360.
- Examine how Civil 3D and Revit data can be shared through BIM 360.

Description

The BIM 360 Design product provides access to the Design Collaboration and Document Management modules within the BIM 360 platform. In addition, access (entitlements) is provided for Revit Cloud Worksharing and Collaboration for Civil 3D. With these entitlements, true collaboration between all members of the project team can be achieved.
Two experts discuss and demonstrate the workflow for such cloud based collaboration using Revit and Civil 3D. The similarities and differences are examined, and some best practices advice is offered. The session wraps up with a demonstration of sharing data between Revit and Civil 3D, using BIM 360.

Speaker(s)

Jefferson Morris' career has been engrossed within the BIM / CAD technologies for buildings as well as civil and infrastructures, which demonstrates his passion for these exciting, albeit still young technologies / methods / systems. Jeff's work has been divided between working as an Infrastructure Application Expert for the Autodesk channel and being a CAD / BIM Manager for large and small multidiscipline firms. Most of his career he has been a consultant / teacher / mentor / implementer - a champion of CAD and BIM.

Now with ASCENT, he develops learning content for their Infrastructure / BIM 360 and Navisworks courses and as well as developing custom content.

Cherise Biddulph is an Autodesk Certified Professional for Revit, as well as an Autodesk Certified Instructor. She brings 15 years of industry, teaching, and technical support experience to her role as a Learning Content Developer with ASCENT. With a passion for design and architecture, she assisted several firms with CAD Manager needs and getting others up to speed on the latest software. In 2004, she joined IMAGINiT as an Application Engineer (AE), where she developed custom training and provided support for customers. She transitioned from her work as an AE to the IMAGINiT Solution Center as a Senior Technical Support

Specialist, where she became proficient in AutoCAD, BIM 360, Navisworks, and Revit. Today, Cherisse continues to expand her knowledge in the ever-evolving AEC industry and the software used to support it.

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Objective 1 - Understand the nature of design collaboration within BIM 360.

The Autodesk® BIM 360™ platform is a cloud based Building Information Modeling solution for project delivery and construction management, allowing stakeholders around the world the ability to co-author and share document and design information. The Design Collaboration module specifically is a solution inside of BIM 360 for project collaboration where multiple team members and firms are involved. For Revit, the two key components in making Design Collaboration successful is BIM 360's Document management and initiating Revit Cloud Worksharing through Revit.

BIM 360 Design Collaboration is a solution inside of BIM 360 for project collaboration where multiple team members and firms are involved. Within Revit, the Design Collaboration module gives teams a central location to collaborate on a project with firms across the globe. Once your project administrator sets up the teams, invites members, and assigns permissions, Design Collaboration provides team members a work space to access, share, and review updated models from other teams, all within an organized timeline.

Project Workflow: Conceptual/Design Development threshold

- When Project grows from one to multiple designers.
- Proper Archiving required, then set project up for multi-user.
- Within Firewall, Xrefs, Drefs Revit Links and a slew of other references shared on the LAN.
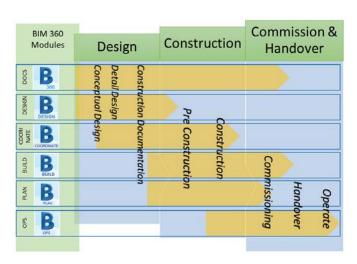- Outside of Firewall, BIM 360 setup, population, Design & Entitlements.

FIGURE 1

BIM 360 Project setup:

- Create a project and activate services.
- Add members to the project, assign services to the user.
- Setup Document Management folder structure, add members and assign permissions, shown in Figure 2.
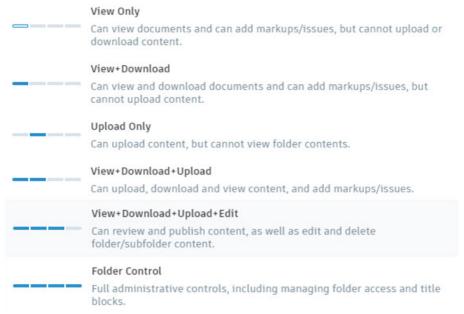- Populate BIM 360 with drawings, Revit Model and Design Data for a project's lifecycle.

View Only
Can view documents and can add markups/issues, but cannot upload or download content.

View+Download
Can view and download documents and can add markups/issues, but cannot upload content.

Upload Only
Can upload content, but cannot view folder contents.

View+Download+Upload
Can upload, download and view content, and add markups/issues.

View+Download+Upload+Edit
Can review and publish content, as well as edit and delete folder/subfolder content.

Folder Control
Full administrative controls, including managing folder access and title blocks.

FIGURE 2

Utilize Existing Project Folder Structure as a Template

When the Document Management service is initially activated, you can apply a **project template**, as shown in Figure 3. This allows you to copy an existing project's folder structure, role permissions, issues, and, if applicable, cost and field settings and templates.
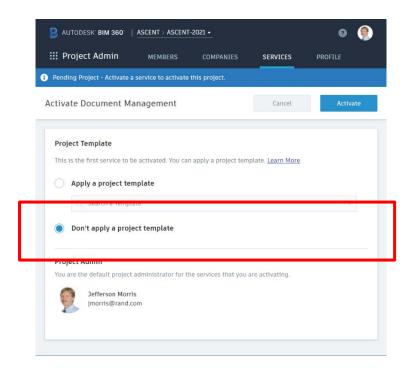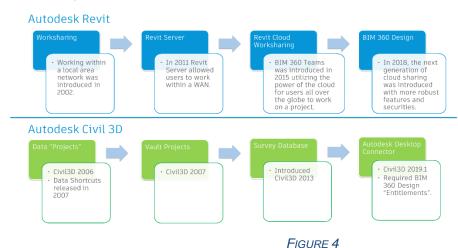
FIGURE 3

Revit Cloud worksharing began with the introduction of BIM 360 Teams in 2015 than three years later with the launch of BIM 360 with more robust features and securities. With the release of Civil 3D 2019.1, BIM 360 Collaboration for Civil 3D was released allowing real-time collaboration outside the firewall.

FIGURE 4

Objective 2 - Experience the cloud worksharing in Revit through BIM 360 Design.

Revit Cloud Worksharing

Revit Cloud Worksharing allows users to collaborate on an existing workshared Revit model, as well as on new or non-workshared Revit models allowing you to facilitate the centralizing of all project designs and data.
An important step in the Revit cloud worksharing workflow is the creation of a publish set, which allows a user to select certain views within their model they would like to publish to the cloud. If a publish set is not created all views will be published to the BIM 360 project.

Revit Cloud Worksharing workflow:

- Have a project set up within your BIM 360 hub. (Created by the Account Administrator)
- Within Revit, initiate your model to the cloud.
- Create a Publish Set.
- Synchronize with Central.
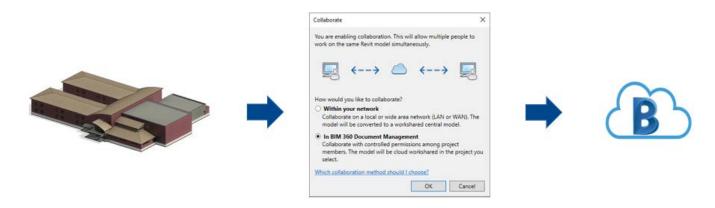- Publish the model to the cloud.

FIGURE 5

BIM 360 Design Collaboration

Stakeholders can review deliverables from the first package to the last and any in-between. It is the projects official record of deliverable exchange. Along with synchronizing and publishing the model, Design Collaboration takes it one step further and gives you extra control of the model and what you want the other teams to have. With enhanced permissions, the Design Collaboration module gives teams a central location to collaborate on a project with firms across the globe.
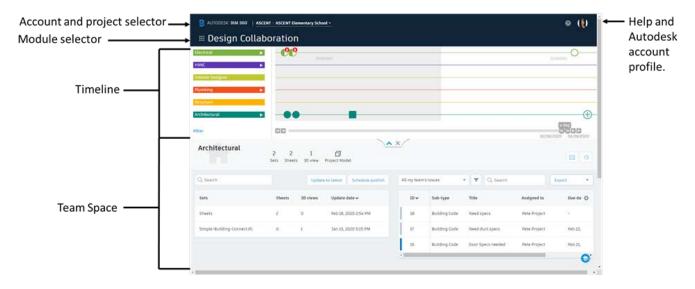
FIGURE 6

Workflow for Design Collaboration:

- Establish workflow strategies.
- Initiate collaboration for your file or upload it to BIM 360 Document Management.
- From your assigned team, create and review packages.
- Preview other teams' shared packages and consume the packages.
- Link the consumed packages into your model within Revit.
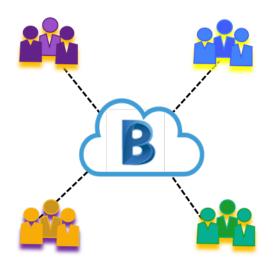- Use the Timeline to communicate and exchange deliverables.

FIGURE 7

Live linking vs. managed linking

Part of establishing a workflow is understanding the types of linking. There are three types of:

- **Live linking** – linking directly from the *Project Files* folder structure.
- **Link Consumed models** – Linking from your team's *Consumed* folder.
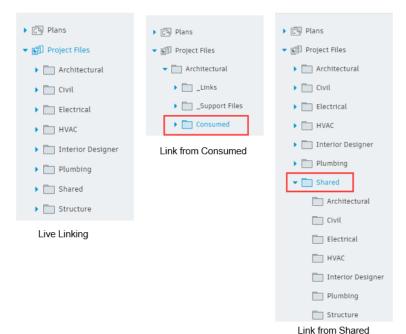- **Link Shared models** – Linking directly to another team's *Shared* folder.

FIGURE 8

Creating a Shared Package

Once a model is published to the BIM 360 project teams have the ability to create a *Shared Package*. This gives teams more control over *what* is being shared and *when* its being shared. The purpose of creating a shared package is, our design at this stage in the cycle has been updated enough that it is worth sharing to other team members.

FIGURE 9

Consuming a Shared Package

Consuming a package allows the various teams to accept another team's updated model into their respective team environment. After reviewing the changes in a shared package model, a member of your team can consume the package. Once consumed, a copy of that model will be accessible in the consumed folder within your team's folder structure in the Document Management module and
through the Revit software. Your team will not get any updates of this model until someone on your team consume another shared package from that team's swim lane in the Design

Collaboration module. Once consumed, the model is automatically updated in your teams folder structure, as well as updated in your Revit workshared cloud model if referenced, as shown in Figure 10.
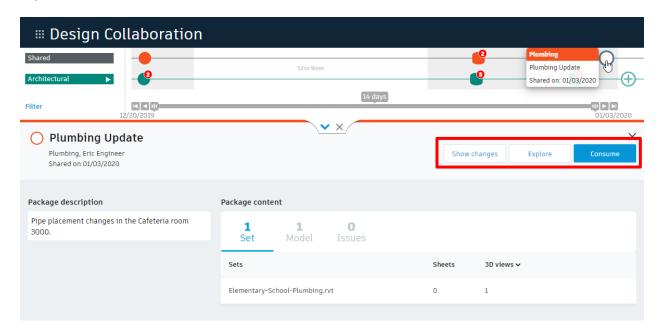

FIGURE 10

Drag and drop the Hub or project folder into the places panel within the import/link dialog box as shown in Figure 11.
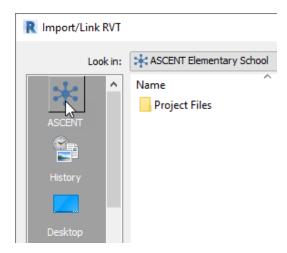

FIGURE 11

Linking the Consumed Package

Only models that have been consumed in the Design Collaboration module will show.

1. How To: Link a Consumed Model
2. Verify you are working from the latest shared package.

3. From the Insert tab>Link panel, click (Link Revit).
4. In the Import/Link RVT dialog box, select your shortcut from the Places panel.
5. Navigate to your team's BIM 360 project folder>Consumed folder.
6. Select the model, verify the Positioning, and click Open.

Exporting the Revit Model to DWG

Export to DWG a 2D plan view and 3D view of your model. This can be saved directly to the cloud through the desktop connector. Once saved to the BIM 360 project, send a notification to the Civil Engineer that it is ready.

It is important while In the DWG Export dialog box to look at the Modify DWG/DXF Export Setup to verify the *Units & Coordinates* tab is setup correct (shown in Figure 12). Set the DWG unit and leave the *Coordinate Base set* to *Internal Origin* so your model does not conflict with the civil engineer's coordinates.
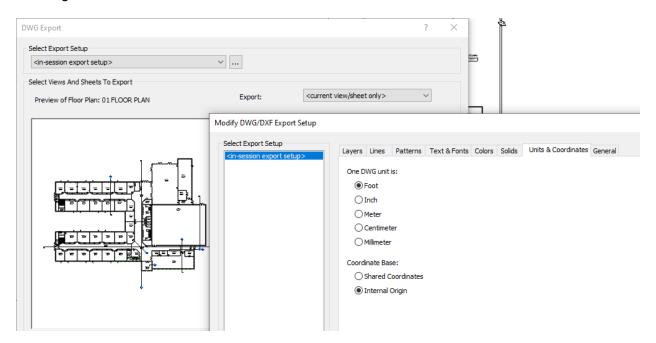
FIGURE 12

Objective 3 - Understand how Civil 3D design sharing with Data Shortcuts and Xrefs can occur through BIM 360.

Civil 3D Collaboration
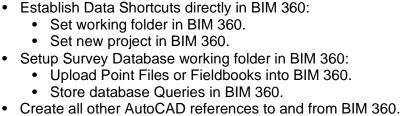
A typical Civil 3D file may contain many references, such as:

AutoCAD Shared Files:
- External References (Xref)
- Images
- Sheet Sets
- Tables / Spreadsheets
- Remote Text (Express Tools)
- Pen Tables

Civil Shared Files:
- Data Shortcuts (Dref)
- Style References
- LandXML Files
- MMS Files (Large Surfaces)
- QTO Spreadsheets

Survey Database Files:
- Survey Databases
- Point Files & Field Books
- Query Definitions (QML)
- Figure Prefixes
- Linecode Sets
- Equipment Databases

AutoCAD Map Shared Files:
- GIS Databases
- Images (and World Files)
- Source Drawings
- Map Books
- Queries
- Topologies
- Object Classifications

For proper collaborations, all these references need to be accessible and available within the BIM 360 project, with proper access rights and proper protection. The challenge is to find all the references within the drawing, upload them into the BIM 360 project into the proper folder and ensure the links within the drawing are valid and point to the proper folders within the BIM 360 project.
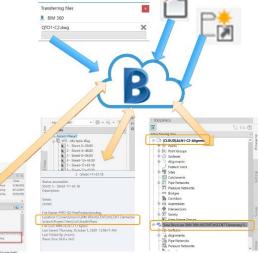
This presentation is not going into any great detail about populating BIM 360 with Civil 3D. AutoCAD and AutoCAD Map data due to time constraints of this Instructional Demo, and also due to the rapidly evolving BIM 360 technology. Since AU 2020 is a virtual event, by the time this is released there is no telling if the workflows are still the most appropriate.

Recommended way to setup Civil 3D Projects in BIM 360

The recommended Civil 3D Worksharing workflow is to start Civil 3D project directly in BIM 360 from the very onset of a project. Failing that, upload the preliminary Civil 3D drawings into BIM 360 at the earliest stage possible, then (as illustrated in Figure 13):
- Establish Data Shortcuts directly in BIM 360:
  - Set working folder in BIM 360.
  - Set new project in BIM 360.
- Setup Survey Database working folder in BIM 360:
  - Upload Point Files or Fieldbooks into BIM 360.
  - Store database Queries in BIM 360.
- Create all other AutoCAD references to and from BIM 360.
- Upload pen tables to BIM 360 project.

In other words, the regular CAD / BIM Standards and Procedures used within an organization should be followed, regardless where the project resides (either within a firewall on a LAN or in the BIM 360 "cloud". As mentioned previously, folder structures, access rights, referencing methods and other standards and procedures are still valid. This will greatly improve acceptance rate of working in a BIM 360 project, for users will feel familiar with the procedures.

Civil 3D Projects in BIM 360

It is usually not practical or feasible to launch a Civil 3D project directly (or at the early stages) of a Civil 3D project. As mentioned earlier, it is at the Conceptual / Design Development threshold when a project grows from a single designer to a design team where collaboration and file sharing procedures are introduced. When the design development stage occurs "in-house", then many references will be created, so that when the project grows beyond "in-house" capabilities and into BIM 360, the drawings can be quite complex.

To date, there is no easy way to setup existing Civil 3D Projects in BIM 360. There are many workflows for transferring these reference files into the BIM 360 Project:
• Manual workflows
• Existing AutoCAD and Civil 3D tools
• (Reference Manager, Data Shortcut Manager, Etransmit)
• 3rd party "automated" processes
• Beta workflows

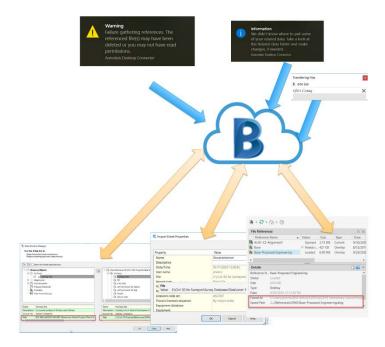*FIGURE 14*

Whichever way is used, you need to ensure the references within the drawing are properly mapped to objects within your BIM 360 project.

Related Data Folder

Once all the drawings and related data is transferred into BIM 360, the references within the drawing need to be checked and repathed, if necessary. Occasionally when BIM 360 uploads a drawing and it cannot find the proper references in its project, it uploads the missing references and places them in a "Related Data" folder to maintain the reference, as seen in Figure 15.

This is a convenient tell-tale for such missing references.
Do not leave these references in the "Related Data" folder but move them to their proper location in the BIM 360 Project and delete the "Related Data" folder(s). Then of course proper repathing within the drawing to the proper location is required.

In the example in Figure 15, the **ASC-Pipe-Styles** style reference will need to be moved to the proper *Ascent-Config* folder and repathed in the Civil 3D Style Reference Manager dialog box. Once moved (and verified), the *Related Data* folder and its subfolders will be deleted.
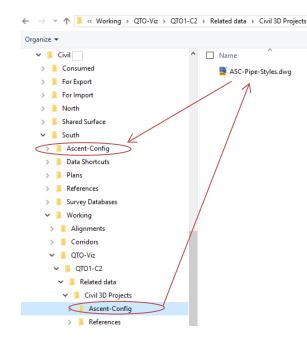
FIGURE 15

Objective 4 - Examine how Civil 3D and Revit data can be shared through BIM 360.

Producing Shared Reference Point(s) (for Revit)

Revit has its own coordinate system and Revit cannot function when the building is too far removed from the origin of that coordinate system (32km or 20 miles). Civil 3D works best in global coordinate systems. In order to make the two systems compatible so that building footprints generated in Revit are properly placed in Civil 3D and that shared surfaces from Civil 3D are properly positioned in Revit, the Shared Reference Point utility has been created.

HOW TO: Create a Shred Reference Point in Civil 3D

- Launch the "Autodesk Shared Reference Point" utility from the *Toolbox* tab of the Civil 3D Toolspace, under Subscription Extension Manager.
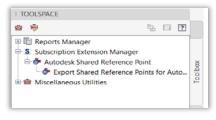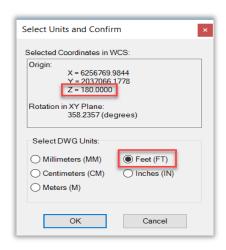- Select the ORIGIN Point of the building.

FIGURE 16

- Select the "+Y Quasi North" point, which is the "Project North" orientation of the Revit Model.
(Tip: use the .XY filter to ensure this point is on the same elevation plane as the ORIGIN Point).

- Review the details in the **Select Units and Confirm** window. In particular, take note of the units and elevation. If the elevation of the base point is incorrect, cancel out and redo, using the .XY filter and providing the proper Z value for the ORIGIN Point.

- Specify the file location (preferably in BIM 360) and the file name for the resulting *.xml file. If you are using different buildings and/or different building location options, the file name should reflect that.

Share surfaces between Civil 3D and Revit using Desktop Connector

Publishing Surfaces (to Revit)

Civil 3D can now publish its surfaces with greater accuracy and visual fidelity than the previous method of importing a LandXML file into Revit. Through publishing a surface, Revit can create a link to this surface via BIM 360.

BIM 360 is required in order to publish and link surfaces between Civil 3D and Revit.
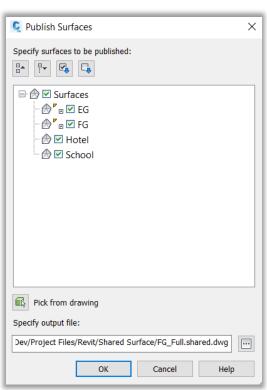
HOW TO: Publish Surfaces from Civil 3D

- Launch the Publish Surfaces tool from the *Collaborate* tab.

- Select the surface(s) you want to publish.

  o The surfaces you select will become one Revit surface.

  o If you want separate Revit surfaces, repeat the above steps for each individual surface required.

- Click on the ellipsis (…) in the lower right corner to select the BIM 360 project and folder to store the surface definition files (which are *.dwg files).

Repeat the process for other surfaces needed to be shared with Revit.

Preparing Revit for Civil 3D data

Because Civil 3D and Revit work in a different coordinate systems, it is important to prepare the model for Civil 3D data by establishing the project base point for the building(s). It is also important to understand Revit's coordinates and elevations as well as communicate with the civil engineers on the shared reference point location which is the civil engineer's origin and quazi north.

Other considerations before linking in Civil 3D data is duplicating views to set to displays orientation to true north. Duplicating system families like level markers, spot elevation and coordinates, and contour labels to display survey point or sea level instead of the project base point which is at zero.

Prepping your Revit Model:

- Establish Project Base Point for the building location.
- Understand the current projects coordinates and elevations.
- Establish the shared reference point with the civil engineer or surveyor.
- Create duplicates of views and setting one to show true north so that the site plan can remain in project base point but duplicate and rename the site plan to site plan true north and set the orientation to true north.
- Create duplicates of system families like spot elevation markers and the label for contours.

When utilizing the Shared Reference point add-in, linking topography and the CAD site will align to the exact location and elevation within the model. Without it, you will have to manual place the linked CAD drawing and topography and establish the shared coordinates which is covered in our ASCENT courseware, Autodesk Revit 2021 Site Planning and Design.

Import Shared Coordinates from XML file

The Shared Reference Point for Autodesk Revit 2021 add-in seamlessly shares location and orientation from Civil 3D to Revit. When imported into Revit, the XML file from Civil 3D establishes the shared coordinates. This add-in is a separate install that can be found in your ▲ (Autodesk Desktop App.).

HOW TO: Import the Civil 3D XML File

1. From the *Add-ins* tab>Shared Reference Point panel, click on Import Shared Coordinates from XML file.
2. First pick is the origin point, and the second point is the Y axis or quasi north. These two points are established by the civil engineer.
3. In the *User Confirmation* dialog box click **Yes** to accept the new shared coordinates.
4. Click **OK** when the successfully set Shared Coordinates.

HOW TO: Set the Models Location to the XML File

1. From the *Manage* tab>*Project Location* panel, select **Location**.
2. In the *Location Weather and Site* dialog box select the *Site* tab.
3. The name of the XML file will be in the list of *Sites* defined in this project. Select on the name and click **Make Current**.
4. Click **OK**.

Importing Topography

When linking in the topography from the civil engineer (shown in Figure 20), make sure to first establish the coordinates given to by the civil engineer or surveyor or acquired from the imported XML file.
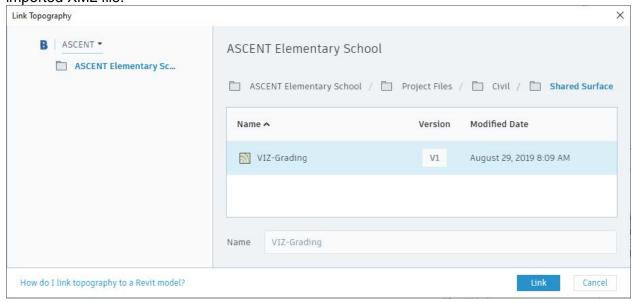

FIGURE 20

Link CAD Site Drawing

When utilizing the Civil 3D XML file, linking a CAD file will automatically come in at the correct location if setting the positioning within the Link CAD Formats dialog box is set to *Auto – By Shared Coordinates* as shown in Figure 21. Note that the *Auto - By Shared Coordinates* is only available when inserting via the Link CAD.
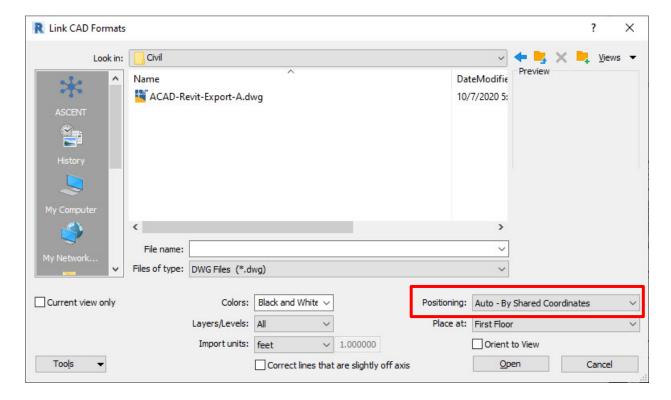
FIGURE 21

Conclusion

BIM 360 Design is an intriguing solution for design collaboration within the BIM 360 "cloud" offering some productivity tools for sharing and distributing design data within a BIM 360 project. For Autodesk Revit, the technology is mature and the tools robust. For Civil 3D, the technology is evolving.

This presentation covered the following objectives:

- Objective 1 - Understand the nature of design collaboration within BIM 360.
- Objective 2 - Experience the cloud worksharing in Revit through BIM 360 Design.
- Objective 3 - Understand how Civil 3D design sharing with Data Shortcuts and Xrefs can occur through BIM 360.
- Objective 4 - Examine how Civil 3D and Revit data can be shared through BIM 360.

BIM 360 Design offers many tools for collaboration and referencing data through the cloud. It is an evolving technology which will only mature and improve as it develops.