Effective Collaboration Techniques for the Architect and Consulting Engineer Using Copy/Monitor in Autodesk® Revit®

AB5281-V

This class will move you beyond the basics of the project execution plan and will examine collaboration practices that can help you better meet the expectations of improved coordination. The coordination tools that are available in Autodesk Revit software enable you to extend your established processes, and this class will provide the know-how to streamline the use of new techniques to augment your workflows. Successful coordination in Revit begins with the coordinate system, and we will cover project and shared coordinate setup along with coordinate alignment techniques. We will demonstrate several round-trip model exchanges to illustrate the best modeling techniques to ensure effective use of the Copy/Monitor and Coordination Review tools. We will also present additional view setup approaches using custom parameters to show you how to supplement the Coordination Review report. This class is a culmination of refining workflows over 6 years of collaboration with clients in Revit.

Learning Objectives

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

- Implement effective model sharing techniques between the Architect and sub-consultants
- Understand Copy/Monitor options and best practices
- Perform View setup techniques to supplement Coordination Review workflow
- Execute modeling practices to ensure reliable use of Coordination Review
- Move the Project Base Point and Utilize the Relocate Project Tool
About the Speaker

Jason has been working as a structural engineer for eight years and adopted Revit as a preferred project document and delivery tool in 2007. He has played an active role in his company’s Revit Implementation Group (RIG) since the company began testing the software. Jason is currently the BIM Program Manager for PES Structural Engineers where his focus is providing BIM production support, creating & implementing efficient analysis to construction document workflows, internal Revit training, research and development of BIM strategies for future business services, and to support BIM marketing and business development initiatives. Jason is active in the Southeast BIM community and stays in tune with the state of BIM and future trends by working on real projects, and conducting roundtable discussions with many architects, contractors, and sub-contractors in the region.

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Introduction

I have been thinking about the content for this class for quite a while now. Over time it has taken different directions based on the current modeling trends we were experiencing with clients on everyday projects. While we occasionally serve as design lead on certain manufacturing or heavy industrial projects we are often in a sub-consulting role working for the architect. I have geared our approach today to speak from the sub-consulting role. So with that in mind, I ultimately decided to take a compellation of these workflow experiences, having worked with many different architectural clients and thus adjusting to many different workflows, to prepare what we will explore today. I plan to touch on a number of specifics today with regard to the model collaboration tools a consulting Engineer uses when exchanging Revit models with clients. It is my goal, however, to demonstrate how different modeling approaches by the project lead affects the consultants. We will discuss best practices learned, but also demonstrate some issues we face, if the project lead is perhaps less familiar with the coordination tools we utilize in Revit.

Preparing the Architectural Model

In the Preparing the Architectural Model segment, I want to share a valuable tip in determining whether the architect is utilizing the project internal or a shared coordinate system. This tip helps us determine the appropriate positioning option to link the architectural model, in my case, into the structural model. It should be noted here that most of these tips discussed today are for your typical small project under 50,000 sf. On a larger project we are able to cover a lot of the issues I bring up in a BIM kickoff meeting or project execution plan. The reality is the kick off meeting just isn’t happening on every project, even though we suggest it to our clients. We also have our own execution plan where we cover things like coordinate system, copy monitor plan, etc. but they are not always well received or thought to be useful by project management.
Coordinates

**TIP #1 – Before you link the architectural model, determine the project base point and site survey coordinates the architect is using.**

I first scroll through the project browser to see if the Architect has a site plan already identified. If not, I will typically try and find a base plan or first floor plan. If the project base point icon is not visible, I will navigate to Visibility Graphics to turn it on. In the model categories under Site, I will turn on both Project Base Point & Site Survey Point.
I will then navigate to the Manage Tab - within the Project Location section – and will click on the Location icon to verify the coordinate system is in fact Internal vs. Shared. I will click on the Site Tab and notice the only site defined in the project is indeed Project Internal & it is current. If there were shared sites being used I would see them defined in this dialogue.

Purge Link

In an effort to minimize the file size of our link it is best practice to Purge Unused Elements that exist in the file. We do that by navigating to the Manage tab on the ribbon. I will select Purge Unused from the settings menu. The number of unused items we are able to discard largely depends on how robust the architect’s template file is.

Project Set Up

Copy / Monitor

_TIP #2 – For all practical purposes Copy/Monitor is not intended to be a bi-directional tool._

Unless you develop a very detailed plan with your Architect about whom the model element author is for each element that needs to reside in both models, the consultant will be the only one utilizing the Copy/Monitor tool. For the workflow to work properly, you will need the Architect to be the creator, or model Element author, of every element that is to be Copy/Monitored. I prefer to steer away from saying the Architect owns the grid, floor, or levels because the reality is they are duplicated, reside in your structural (or mechanical model), and can be manipulated. I will point out that you quickly get into trouble in this workflow, if both the consulting engineer and the Architect are creating grids in their own models.
**Element ID**

*Tip #3 -* The Element Author should avoid deleting and redrawing any element the consultant is copy/monitoring. Instead, these elements should be moved if updates are necessary.

Copy/Monitor tracks elements by Element ID. If an element is deleted and redrawn, the element ID is erased; therefore, the link to the particular element is broken.

**Copy/Monitor Plan**

Consider dedicating a section of your Project Execution Plan to defining the Copy/Monitor process. You might include a section similar to the image below.

5.3. Elements to be Copy/Monitored by PES Structural Engineers

<table>
<thead>
<tr>
<th>Elements</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grids</td>
<td>Recommended</td>
</tr>
<tr>
<td>Levels</td>
<td>Recommended</td>
</tr>
<tr>
<td>Floors</td>
<td>Recommended</td>
</tr>
<tr>
<td>Columns</td>
<td>Not Recommended (unless Arch place by Grid)</td>
</tr>
<tr>
<td>Walls</td>
<td>Not Recommended (Monitor after Copy/Paste Aligned)</td>
</tr>
</tbody>
</table>

5.4. Recommend completing E202 matrix if more detail is required.
View Set Up Techniques

Custom Parameter & View Filter

*TIP #4 – To supplement Coordination Review, utilize custom view filters in a dedicated QC view.*

The intent of the Grid Coordination view shown below is to allow for a quick visual review as the project progresses. Using this view and a quick visual inspection, identify any grids that are not green to see if they are new to the project since the latest model exchange.
Minimize Element Duplication

**TIP #5 – Have a plan for the elements that will be shown utilizing the linked model.**

There are certain architectural elements that may need to appear in the structural 2D-documents. Common examples may be interior partition walls, stairs, occasionally column wraps, occasionally veneers. In a similar manner, the Architect may want to show purely structural elements such as structural columns in plan or structural framing in their sections. Some thought and consideration from both parties needs to be applied in this workflow if the intent is to utilize each other’s link to show the elements.
**TIP #6** – To avoid common visibility issues it is best practice to model as to how it will be constructed.

**Worksets**

It is best practice to keep worksets to a minimum. It is a good rule of thumb to create worksets for elements that need project level visibility control. A prefix or suffix added to your workset is helpful in allowing the client to distinguish between worksets from multiple links.
**TIP #7 – Be specific as to the phase of the project during which elements can be considered sufficiently accurate to show thru the link (i.e. sloped framing).**

We are accustomed to modeling structural framing accurately for the Architect to utilize in their sections. One expectation that we try to communicate early on in regards to sloped framing is when the Architect should expect to see our modeled elements sloped, and thus rely on our model link to show framing in these sloping areas. Before we were swapping models for coordination, engineers were not showing top of steel elevations during the Design Development phase. This always happened at some point later in the design process. As a rule of thumb, we intend to hold off on sloping our framing until column grids, clear heights, top of parapets, top of steels, roof pitch, etc. are flushed out. This helps minimize rework during the iterative design process.

**Model Communication**

I know the Bulletin Board drafting views are very common. We have been utilizing the Bulletin Board for several years now. We request brief narratives from our clients when major model updates occur. For this communication, we like to utilize the Bulletin Board to post these model updates or narratives prior to the model exchange. In this way the update narrative stays with the model. We also copy and paste the update post into our file transfer remarks. We have found this to be efficient and well received by our clients, especially during the high-frequency exchange phase of the project. Alternatively, it gets to be quite cumbersome to match up a myriad of emails with a given model during those high frequency exchange times.
Coordination Review

The Coordination Review tool identifies change to any elements that we previously copy monitored. As I mentioned previously it does this by the element ID. In our workflow example we will demonstrate how to handle typical project progression and accommodate grids that have moved or been renamed and new grids that were not present prior to our last exchange. We also discover how Coordination Review handles floor modifications.

**TIP #8** – It is best practice to resolve all issues identified in Coordination Review upon each model exchange. If you let the list build up it will quickly become unmanageable.
TIP #9 - It is best practice to resolve each rule issue identified in Coordination Review separately.

<table>
<thead>
<tr>
<th>Message</th>
<th>Action</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>New/Unresolved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintain relative position of Grids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grid moved</td>
<td>Postpone</td>
<td></td>
</tr>
</tbody>
</table>
Project Relocation

Relocate Project Tool

*TIP #10— Use the Relocate Project Tool to ensure you are selecting all model elements*

For our final piece of model collaboration, I will focus on how we handle a situation that requires the model to be relocated after we are well into the project’s development. This can be achieved in a couple ways, but I like to utilize the Relocate Project tool located on the Manage tab. The Relocate Project ensures that I am selecting all model elements, but will also move my project base point.
Clipped vs. Unclipped

*TIP #11*  Use the paper clip icon to unclip and re-clip if you need to simply move the project base point relative to the current location while maintaining position of the model elements.
Summary

Today we covered a number of tools and workflows within Revit regarding collaboration between the design lead and consulting engineers. It is our goal to leverage the tools we have within Revit to be as efficient as possible. The key takeaway I tried to convey today is that it is just as important for the design lead to understand the coordination tools in Revit as it is for the consultant who is executing the tools. That is to say, we understand the project lead, may not need to use Copy/Monitor or Coordination Review, but it is key to the success of the collaboration effort for them to understand how their consultants utilize these tools.

It is my hope that you that you may be able to implement some of these practices on your everyday projects. Some of the tips we covered, in prepping the architectural link and project set up, can be used as a reference for team members in your firm that may be new to the process of model sharing. The view set up techniques we examined can be instrumental at supplementing the Coordination Review tool in Revit. If nothing else, perhaps all of the scenarios we demonstrated on how to relocate your project after the initial project base point has been moved, may serve as a reference when you encounter this on a future project.