Coordinating and Sharing Information with Revit® Architecture and Revit® Structure – Best Practices!

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SE304-1 This class identifies best practices using Revit Architecture and Revit Structure for sharing and coordinating information. You'll explore in depth and step-by-step how to use Worksets efficiently and how to coordinate the design team's work more effectively. You'll improve your project work flow and design-team integration and reduce time spent on detective work solving coordination issues with inter-discipline models.

About the Speaker:

Erleen Hatfield is a Principal at Thornton Tomasetti Inc. and has over 15 years of structural design experience. Ms Hatfield is exceptionally well versed in all aspects of BIM and all of it's associated technologies. At Thornton Tomasetti she is the visionary responsible for our Integrated Modeling Services (IMS) which is a branch responsible for all things related to BIM/Automation/Detailing and Visualization. Ms Hatfield has many years of hands on experience with many BIM projects and software packages including, Revit, Tekla, Catia, AutoCAD applied to many different building types.

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Introduction

For a successful BIM project, technical proficiency in the software is only a part of the equation. Management and organization of the BIM model play a large role in coordinating between the design team members. The key is not to treat Revit (BIM) as simply a change in drafting software, but as a tool that can integrate software and professional practice. This class will address issues concerning management and organization of BIM models, as well as tools and methods that impact the coordination process between the Architect and the Structural Engineer.

Overview of topics for Revit Coordination Best Practices:

1. **What software are your clients/consultants using?**

2. **What design intentions or interferences do you need to communicate?**

3. **What is the easiest way to achieve coordination?**

4. **How can this all be recorded?**

5. **Coordinating designs with non-Revit consultants?**

6. **How do you deal with changes?**

7. **Who owns what, the new area of BIM contracts?**

8. **Tools & Methods to achieve well coordinated documents in Revit**

    I.   **Compatible Platforms**

    II. **Linking/Importing Files**

    III. **Geometry Constraints**

    IV. **View Browser Organization**

    V.   **Structural Analysis Coordination**

    VI. **Copy Monitor – Coordination Review**

    VII. **Interference Check**

    VIII. **Export to AutoCAD**

1. What software are your clients/consultants using?

The ideal model setup for coordination is for each consultant to use the same software (Revit). At the outset of a project it would be best to identify what software each design team member intends to use so that any problems with interoperability can be foreseen. During the course of a project upgrades or changes to the version of a software package can occur and it is best practice to allow for this when dealing with consultants that may not want to upgrade to newer software.

If a design team member is still using something as basic as 2d cad, it is still perfectly feasible to make use of this kind of information in a Revit model, either as background Linework or else as lines upon which to trace particular items using some of the native tools for items such as grids, levels, wall, and beams.

When discussing the software choices of all the design team members it is best to bear in mind that some software programs do not offer the same level of interoperability as others. Examples of this are some of the specialist structural analysis programs that do not export information to cad or to Revit very easily. With this in mind it may be necessary to develop custom routines or scripts to make particular software's talk to each other.

2. What design intentions or interferences do you need to communicate?

At the outset of a project it is highly recommended to start communicating what major elements will need interference checking. Some parts of a building or structure can have more complexities than others and therefore can take better advantage of the more sophisticated tools that Revit has to offer. Some of the best practices for this type of coordination are:

- Coordination setup of model extents or zones with design team

- Use grids, reference planes, levels or wireframes to communicate complex geometry

- Use naming conventions across all disciplines drawing sheets.

- Establish a standard level of detail.

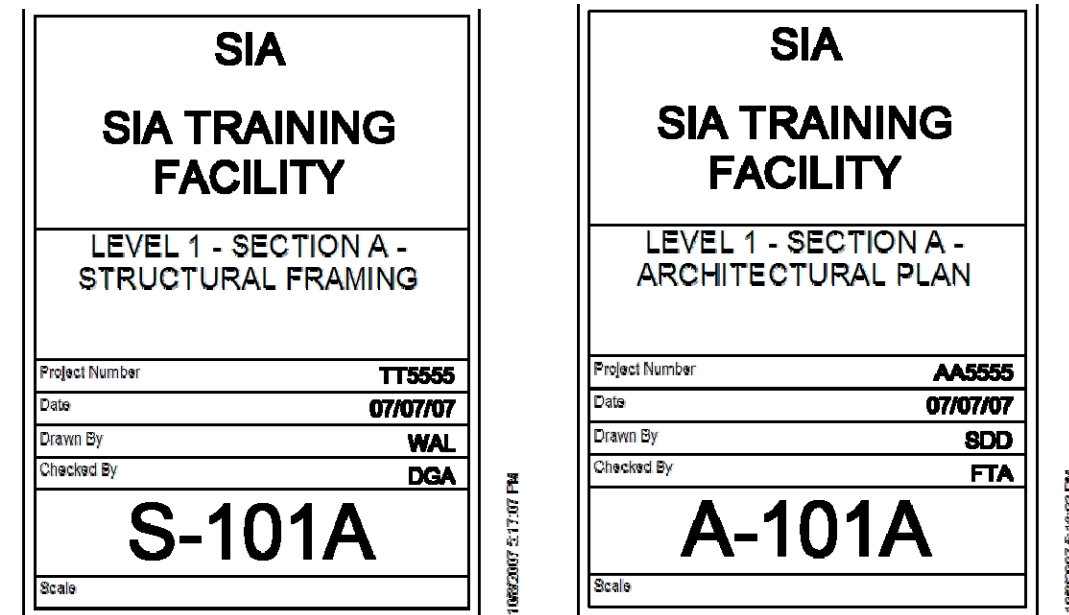- Use clash checking for coordination.
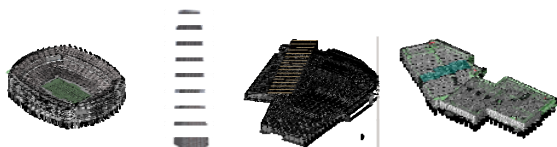
3. What is the easiest way to achieve coordination?

The easiest way to achieve efficient coordination is to get all of the design team to agree on a logical structure for the BIM model. Creating project standards for items such as the software in use, file naming, sheet naming etc. can all go a long way in creating a more efficient environment for the coordination efforts on a large job.

Establishing ownership of items such as gridlines or levels for example can really help as the responsibility is maintained by one member. To extend this level of accuracy, using Revit's tools for copy/monitor or clash detection, the other design team members can maintain the same geometry without any errors.

SIA	
SIA TRAINING FACILITY	
LEVEL 1 - SECTION A - STRUCTURAL FRAMING	
Project Number	**TT5555**
Date	**07/07/07**
Drawn By	**WAL**
Checked By	**DGA**
S-101A	
Scale	

SIA	
SIA TRAINING FACILITY	
LEVEL 1 - SECTION A - ARCHITECTURAL PLAN	
Project Number	**AA5555**
Date	**07/07/07**
Drawn By	**SDD**
Checked By	**FTA**
A-101A	
Scale	

4. How can this all be recorded?

Recording all of this information is made very simple based on the fact that Revit is a single file model, there is not the complication of having hundreds or possibly thousands of dwg files which would be typical of traditional Cad programs. Saving a copy of the model at benchmark issues is definitely a best practice and is very easy to perform as only one file needs to be saved.

When working on very large Revit models that may be setup with Worksharing or Worksets, it is a very good practice to include comments when performing a "Save to Central" so that at particular times the model can be saved to another copy or rolled back if necessary.
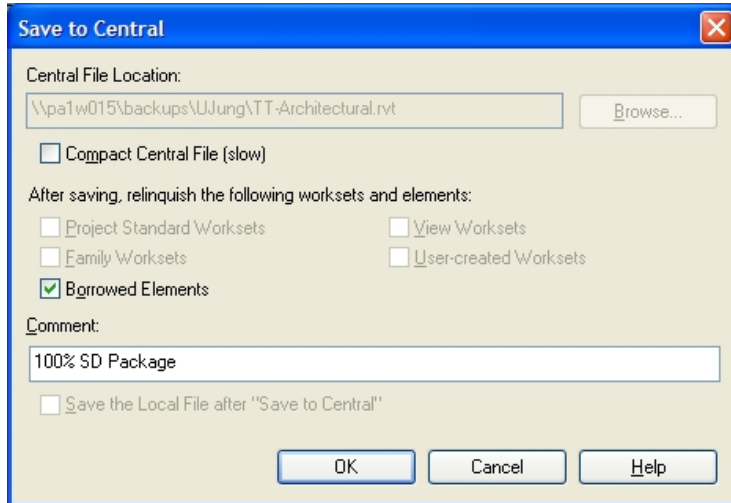
Another method to record the evolution of the BIM model is to using reporting tools within Revit to save html reports of the interferences in the model. These can be useful to send to consultants to communicate where potential clashes are occurring. The consultant can then use tools such as "Select by ID" to find the pertinent members in the model.

5.   Coordinating designs with non-Revit consultants?

For very large BIM models the combination of all discipline's models may require neutral model management software such as Navisworks. The use of such software can make it easier to clash check and visualize very large or complex models, especially if some of the design team members are not using the Revit platform.

One of the many useful tools that Revit has for coordination in conditions where a multi-platform BIM is in effect is the use of the 3d Dwf file which is a very lightweight file that can be emailed if necessary.

Revit is able to batch export 2d or 3d cad files from the model, this can make it very easy to work with non-Revit consultants that require dwg or dgn files for coordination. The export of such files is very streamlined and should be tailored to suit the standard layer and linetype setup for the company cad standards.

6. How do you deal with changes?

Dealing with changes in Revit is what the software is designed to do. Using the native tools such as Copy Monitor makes it extremely efficient to modify the design to match new geometry or design options. Setting up the Revit model to look for the latest linked models can make reloading the latest version of consultant's models very simple and efficient. This can be done very simply in the Revit software and basically involves using the "Manage Links" tool to point the linked model at the latest version of a consultant's model.

When working with a new model from a consultant it is definitely a best practice to utilize whatever new grids or levels that have been created or modified in their model. These items are the cornerstones of the BIM and should be maintained very accurately which is very easy to do if using Copy Monitor.
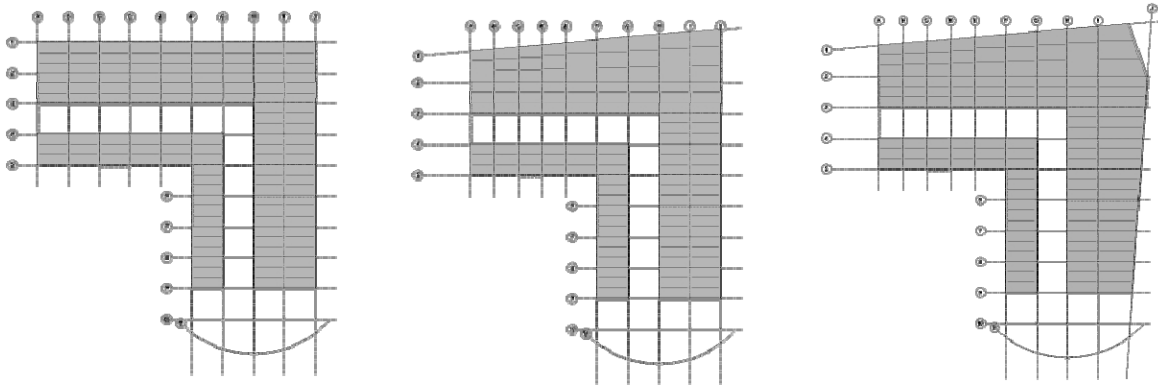
7. Who owns what, the new area of BIM contracts?

With this new BIM technology maturing new issues are appearing such as who owns the final BIM model? Deciding who will be ultimately responsible for the complete model at the conclusion of a project, or who will be maintaining as-built models for the project is very important, so as to avoid repeat work or unnecessary survey work.

Other decisions that are critical to efficiency are items such as whether the fabricator or detailer will be working from the model? Also the consequences of sharing the digital model with the contractor could have a very positive influence on the communication of the design and execution on site.

These issues should be covered in the contracts for BIM projects so that lines of demarcation are setup for each member of the design team.

8. Tools & Methods to achieve well coordinated documents in Revit

i. Compatible Platforms

1. For the maximum efficiency of tools, Revit Architecture and Revit Structure should be used simultaneously (same version)

2. 2D drawings can be linked/imported so working with a design team member that uses 2D is not out of the question

3. 2D drawings can in fact be used for tracing once linked/imported

4. Linking rather than importing allows cleaner purge when the link/import is removed

5. Do not "explode" CAD files unless absolutely necessary

6. Trace standard details with Native Revit Linework to form a Revit details library.

7. Depending on project size and intent, breakdown of imported/linked 3D model by category may be needed

8. 3D dwg, Bentley and Sketchup files can be imported, but you lose capability of some tools. Being aware of the capabilities will be helpful in the long run.

   a. Symbolic representation will not work

   b. Automatic hatching & recognition of material will not work

   c. Sections and elevations will still work.

ii.   Linking/Importing Files

1. Consider project size before linking/importing

2. Project director/manger should have input on what files are linked and imported because this will affect the project model in the long run

3. The modeler should be aware of the frequency of revisions (weekly, bi-weekly?) of the other models

4. Origin (0,0,0) should be maintained throughout all design team member's drawings. This is much more crucial than in 2D drawings.

iii.   Geometry Constraints

1. Geometry constraints are a significant part of BIM models and so should not be ignored.

2. Consider the size and complexity of project before deciding on how far to take advantage of the parametric modeling

3. Manager input and more detailed knowledge of design and construction is necessary to take full advantage of geometry constraints.

4. Constraints must be consistent and accurate to be effective.

iv.   View Browser Organization

1. All views and sheets are in one file, so organization is key.

2. The standard organization can work for smaller projects, but custom organization may be necessary for larger, more complex projects.

3. Customize for intuitive understanding for others that may work on the model.

4. Use "Project Parameters" and apply to Views for custom organization. (i.e. "For Reference Only" or a separation of "Perspective" and "Orthographic" for 3D views may be necessary)

v. Structural Analysis Coordination

1. For engineers, importing the model from 3rd party analysis programs can save redundant modeling time, leaving more time to design and coordinate project.

2. The question really is if a bi-directional link should be maintained between the analysis programs and Revit. The issues to consider with bi-directional linking include:

    a. Multiple analysis programs may be used on one project

    b. Accuracy between import and export

    c. Large file size and complex geometry transfer

    d. Accuracy standard difference between analysis model and Revit model

3. Depending on project, one way import may be more useful.

4. Level of accuracy is based on Engineer's attention to detail during analysis modeling

5. Consider the Engineer's modeling role

6. Custom interoperability between programs will be necessary at some point.

7. Some designs & building types do not lend themselves to this process.

vi. Copy Monitor – Coordination Review

1. Only 5 types of model elements can be shared – levels, floors, walls, columns & grids

2. Keep in mind that copy/monitoring elements depends on the project and that there is no absolute standard.

3. This tool can be a managerial tool as much as it is a "drafting" tool

4. Consider the fact that the party responsible for the geometry (i.e. slab outline - architect) may be different than the party responsible for its properties (slab thickness and reinforcement – engineer).

5. Coordination Review can be used only after copy/monitoring is set up and there will even be an automatic notification.

6. Create/save HTML Coordination Review Report once Coordination Review is completed then export to Excel format – since the Excel format allows better organization and manipulation of data.

7. Identify person responsible for the "actions" (manager or modeler).

8. Do not ignore the "add comments" option for record keeping purposes.

vii. Interference Check

1. Similar to the Coordination Review Report, copy the HTML Interference Check Report to Excel format for better organization.

2. There is no need to select all element types when doing coordination report.

3. Communicate between design team, what elements can and can't be checked for interference (i.e. gusset plates, connections, etc.)

4. Once in Excel format, separate instances to be ignored that are common modeling practices (i.e. standard practice with columns and slabs).

5. It is also good practice to separate instances of error in modeling and interferences that arise from design issues.

Viii. Export to AutoCAD

1. Exporting to AutoCAD is useful for design team member that does not use Revit and for visualization purposes

2. Creation of Xrefs, Layers, and titleblocks with viewports are automated, but keep in mind that customization and back-check might be necessary

3. 2D DWF may work better for simpler viewing and printing (no worry about Xrefs)

4. A Revit model can also be exported as 3D ADT.

5. When exporting to 3D, check level of detail (i.e. Coarse, Medium & Fine – structural members in fine detail show even the fillet radius adding additional geometry that may not be necessary)

6. 3D ADT may not recognize all Revit objects such as foundations and coping of structural members.