Effective Techniques for Large Projects Using Revit® Architecture

James Vandezande, AIA – Skidmore, Owings & Merrill
Robert Manna – Burt Hill

AB218-3P   Learn some of the best practices and techniques for managing Revit Architecture on large projects that have several team members. Topics will include managing and coordinating large amounts of Revit project components, configuring worksets for maximum flexibility, coordinating and dividing a project among multiple Revit models, and effective standards and tips for documentation, such as Code Analysis.

About the Speakers:

James is a practicing architect and Associate at Skidmore, Owings and Merrill (SOM). He has been the Digital Design Manager for SOM's Eastern U.S. offices since 2001 and has led the development of CAD standards, customization programming, training and education, and is a member of a firm-wide committee evaluating future technologies.   These technologies include modeling, analysis and simulation tools to be used in a holistic BIM work process.

A Bachelor of Architecture graduate of the New York Institute of Technology, James is currently teaching Revit Professional at NYU, serving as the AUGI Revit Community Chair and is President of the New York City Revit User Group.   He maintains a blog focused on various building information modeling tools at http://allthingsbim.blogspot.com and has presented to many audiences at conferences such as Autodesk University, the Construction Management Association of America and Vismasters DVMC.

Robert is a practicing staff architect at Burt Hill's Philadelphia office. He has helped to lead Burt Hill's efforts to adopt a workflow based on new, information rich tools across the entire firm. As part of that commitment Burt Hill continues to push hard to achieve its goal of 100% practicing employees using Revit and other intelligent design and analysis tools. At the same time they continue to explore more advanced tools and work to integrate those on projects that can best benefit from advanced design and documentation processes.

Robert holds a Bachelors of Architecture and Bachelors of Building Science from Rensselaer Polytechnic Institute. He continues to help lead the efforts to establish an active Revit User's group in Philadelphia and writes a blog about experiences with Revit and BIM at: dorevit.blogspot.com. He has also had the opportunity to do several small presentations in the Philadelphia area regarding BIM and Revit for the AIA and ACEC. Robert is also involved with groups organized by the AIA LFRT and AGC BimForum.

Outline

Introduction
Review the goals and learning objectives of the class. A bit about the speakers, their experience and the important methods of implementation to remember throughout each presentation topic.

Hardware & Infrastructure Requirements
A brief overview of the hardware and networking requirements that work well with Revit Architecture in a large project scenario.

Best Practices for the Team
An overview of some important guidelines every team should follow.

Standards & Settings Management
Above and beyond Object Styles and Line Weights…

Project Browser Customization/Managing Views
Learn step-by-step procedures to make efficient use of Revit's Project Browser when working with hundreds or even thousands of views in a single file.

Controlling Views / Drawing Consistency
Best practices and guidelines for keeping the graphical nature of views consistent and getting more information out of your views.

Workset Configurations
Best practices and guidelines for using worksets to your advantage on large projects with large teams. Learn techniques to organize data and conserve system resources.

Linked Models
Dividing a large project using several linked Revit models.

Cross-Platform Interoperability
A look at processes to include geometric information from other software platforms in the case of structural coordination, unique massing, and ultra-custom component creation.

Attendees will be better equipped to:

- Make their project teams more efficient and effective

- Overcome common implementation obstacles

- Take on larger, more complex projects

Autodesk

Introduction

Review the goals and learning objectives of the class. A bit about the speakers, their experience and the important methods of implementation to remember throughout each presentation topic.

Since Revit's conception from the loins of Charles River Software, questions from practicing industry professionals have arisen concerning its ability to perform under rigorous demands. We hear time and time again, "You can't do that with Revit!" This course will explore some of the things many said could not be accomplished in this underrated platform.

Most of the presented content is focused on intermediate to advanced concepts in Autodesk Revit and assumes some basic knowledge of fundamental concepts. To learn more about basic functions, refer to the Revit Tutorials and other printed training material.

Hardware & Infrastructure Requirements

A brief overview of the hardware and networking requirements that work well with Revit Architecture in a large project scenario.

"Hi! I'm the BIM Gnome – denouncer of common Revit myths."

The first and most obvious myth - if you've ever attempted a **large** project in Revit – are the minimum system requirements. We are pushing around an extreme amount of data which requires extreme, but not uncommon, hardware solutions.

The minimum system requirements by Autodesk:

- Microsoft® Windows® XP (Professional, Home, Tablet PC Edition) or Microsoft® Windows® 2000 SP4 (or later)
- Intel® Pentium® 4 1.4 GHz or equivalent AMD® Athlon® processor
- 1 GB RAM
- 1 GB free disk space

Realistic Recommendations for Large Projects:

- RAM: 3 GB+
- Processor: Dual- or Quad-Core Processor @ 3.0 GHz or higher
- GPU: nVidia Quadro FX 256Mb+
- Gigabit Ethernet *

* - Although the time spent channeling data from your workstation to the central model on the server is less than 10% of the total STC (Save to Central) time, using gigabit Ethernet greatly reduces the total save time.

STC Tip #1: Remember, STC consists of the following (in order):

1. Reload latest changes from central

2. Reconcile those latest changes

3. Publish your local changes to central

4. Save your local file (if option is checked in STC)

To save time, periodically use Reload Latest Worksets and save locally *BEFORE* saving to central.

STC Tip #2: Access to the central file is first come, first serve. You can always cancel the 'ignition key' dialog and try again later without losing any work. Just don't wait too long between STC's as your local model might become irreconcilable with the central file, especially when more of your team mates are working on the same model.

STC Tip #3: On projects with a large number of team members, or exceptionally large projects, you may want to consider establishing a rough STC schedule for users to follow.

Best Practices for the Team

An overview of some important guidelines every team should follow.

Communicate: Ensure the BIM team is properly communicating at all levels. Use something simple such as instant messaging to keep the production team in-sync. Schedule regular meetings to discuss tips, tricks, issues with the model and plan for upcoming project milestones.

Divide & Conquer: The cleaner project task work is divided, the better. Senior team members must realize the obsolescence of the plan/section/elevation assignment paradigm. Assign task work based on components of the building – not series of 'drawings.'

Working Remotely: If you intend to develop a project where your team is distributed in different offices, you have two basic options: 1- share a central model on one server and use a server caching appliance such as Riverbed's Steelhead or I-Share to facilitate the network traffic of the remote team members or, 2- divide the project into distinct 'chunks' which are then linked together to form the whole.

Team Structure: In a webinar on Building Information Modeling, Glenn W. Birx AIA of Ayers Saint Gross illustrated the following differences in how their team structures have changed using Revit to complete small projects.

Traditional project approach:

Week No.	1	2	3	4	5	6	7	8	Total
Principal	4	4	4	4	4	4	4	4	32
Project Manager	16	16	16	16	16	16	16	16	128
Project Architect	24	24	24	24	24	24	24	24	192
Architect	40	40	40	40	40	40	40	40	320
Intern	40	40	40	40	40	40	40	40	320
Total Hours									**992**
Average Rate									**$92.74**
Fee Target									**$92,000.00**

BIM project approach:

Week No.	1	2	3	4	5	6	7	8	Total
Principal	4	4	4	4	4	4	4	4	32
Project Manager	24	24	24	24	24	24	24	24	192
Project Architect	40	40	40	40	40	40	40	40	320
Architect	24	24	24	24	24	24	24	24	192
Intern	0	0	0	0	24	24	24	24	96
Total Hours									**832**
Average Rate									**$110.58**
Fee Target									**$92,000.00**

As you can see, BIM requires more attention of senior team members, but less time overall. We have also discovered truth in the so-called "McLeamy Curve" in that more effort is required earlier in the design

cycle. Using Revit, however, does not seem to increase the staffing requirements or prolong required deadlines in Schematic Design and Design Development.

Support: Although formal technical support is a critical factor to the overall success of any BIM team, we have created a new role which has ensured a high level of efficiency and satisfaction within our project teams. This new role is the "Digital Design Specialist" and whose members are architects and engineers with an advanced understanding of Revit and the BIM process as a whole.

As shown below for a project using CAD tools, most Project Team members are familiar with the software and processes; thus requiring only support and consulting on a part-time basis.
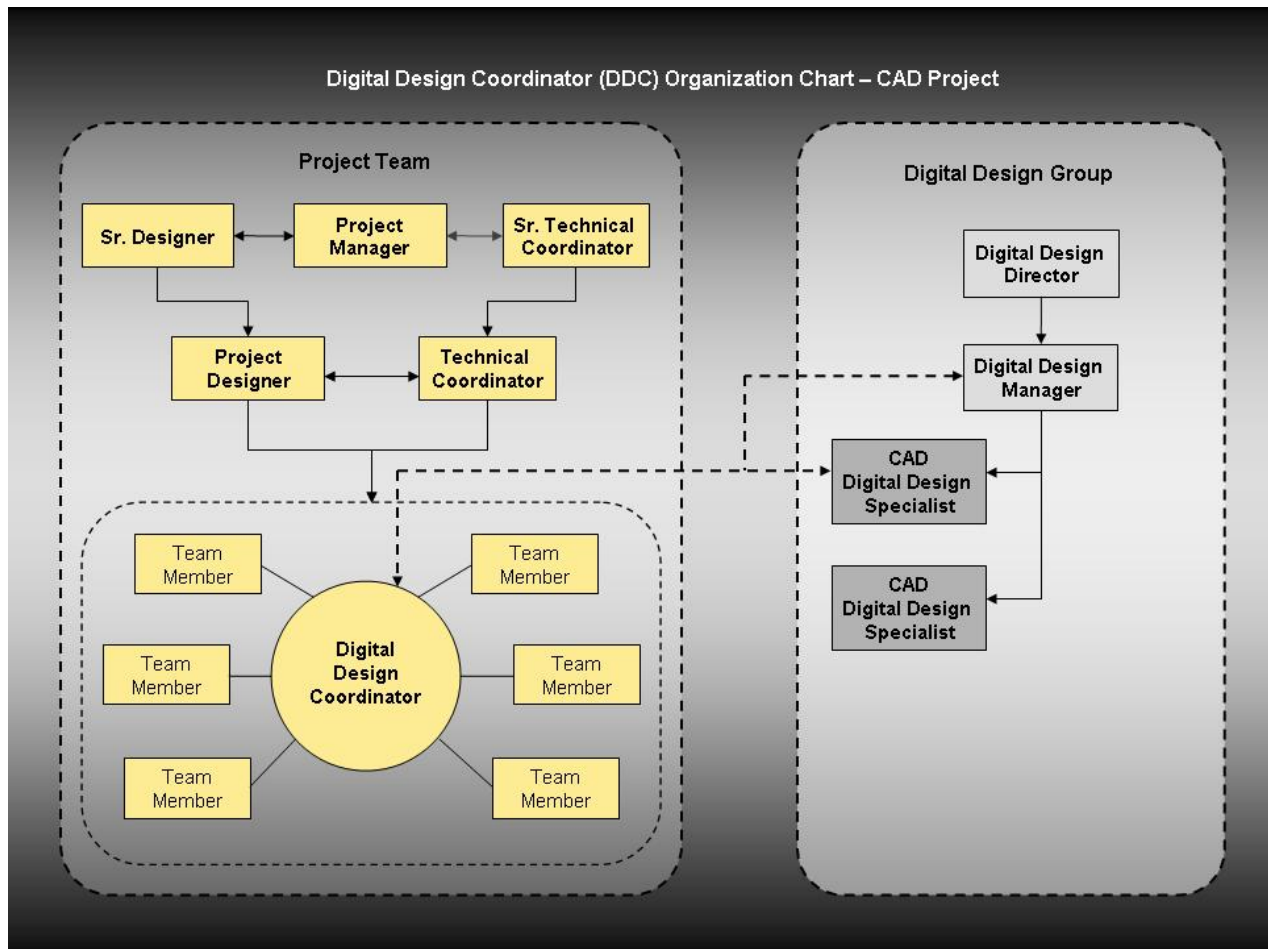
For BIM projects, we encourage the placement of team members with Architectural or Engineering experience as well as an advanced understanding of the chosen BIM tools. These specialists must function between the senior members and the junior members of the team in order to facilitate decisions and actions throughout the course of the project. It is important to distinguish between support and specialist – where support does not have the ability to influence team decision-making, rather only serves to troubleshoot software and training issues based on potentially counter-productive design and task decisions.
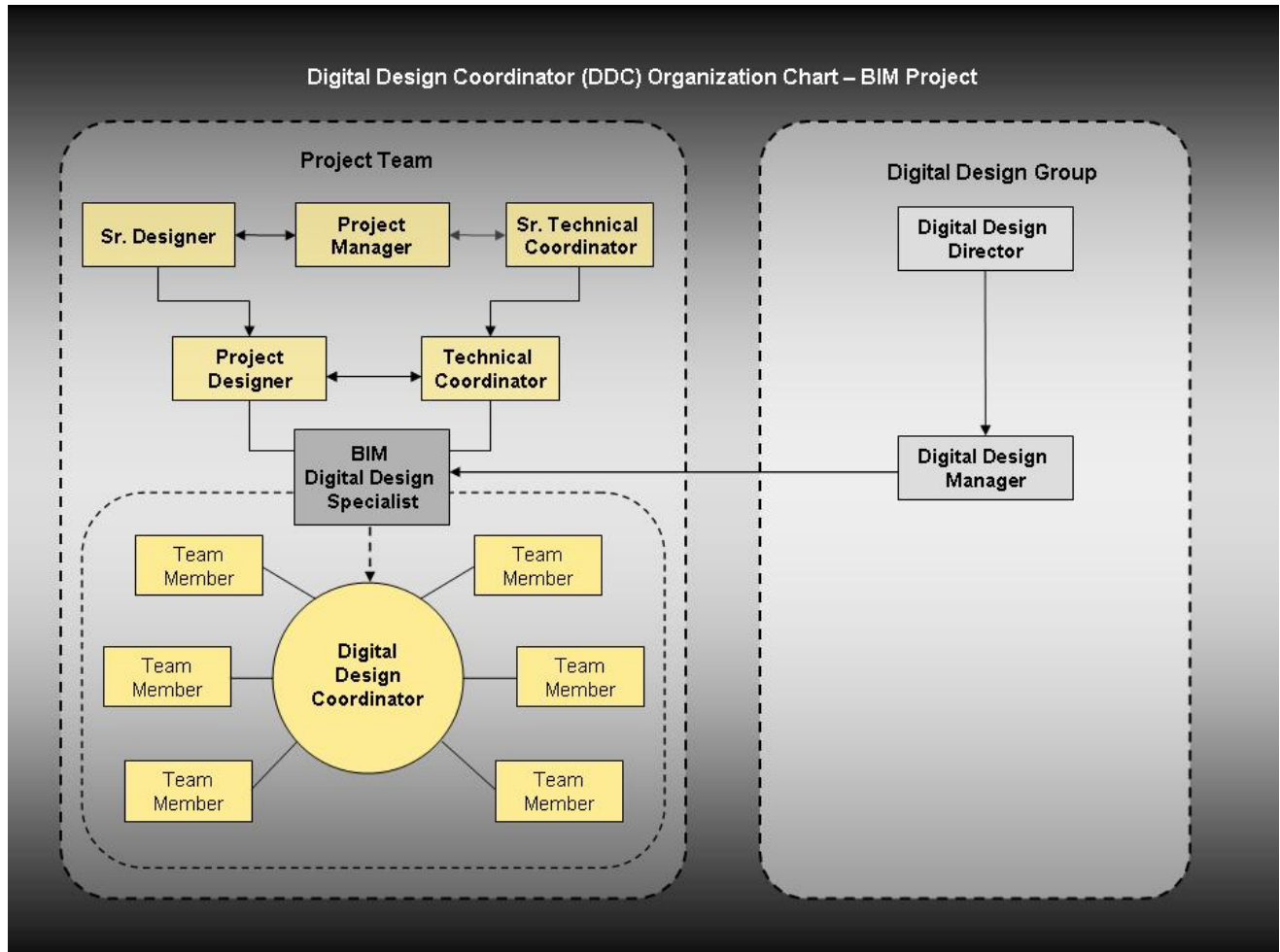
Many firms consolidate the roles and responsibilities of the "BIM Digital Design Specialist" and "Digital Design Coordinator" into a central position such as BIM Model Manager. Whatever your manpower and budget allows, always account for the requirement of workflow guidance because BIM is definitely NOT the next iteration of CAD.

Standards & Settings Management

Above and beyond Object Styles and Line Weights…

While Revit does an excellent job managing settings within the project file (units, visibility, text, etc.), some other subtle files and settings can either help or hurt your team when larger groups are involved.

Deployment – When installing Revit in a larger office it is easier to develop a network deployment package for installation. The following are my recommendations for configuring the deployment for most effective coverage and standardization.

- Revit families are placed in a network location, accessible by the entire office. Content is not installed to the local workstations.

- Rendering content and training files are copied to the users' workstations

- The installation infrastructure for the Revit and AutoCAD 2008 verticals has been updated to provide a similar experience for CAD Managers. The settings for network deployments have been enhanced, but still require a few minor customizations:

  o The new Revit deployment does not remove old builds – if one exists, the deployment exits. To push a new build, include a script call to remove the existing application as shown below, replacing the program ID between the brackets:
  ```
  msiexec /x {4A11206C-4377-49E8-911E-B11548658FF3} /qn
  ```

  o Launch the deployment with the following line of code:
  ```
  Call \\server\folder\deployment\setup.exe
  \\server\folder\deployment\AdminImage\DeploymentName.ini
  ```

  o The settings for the deployment's Revit.ini file can be edited in the following subfolder of the deployment location:
  ```
  \AdminImage\RevitSetup\RevitBuilding\Revit.ini
  ```

  o Also realize that changes can be made to the Revit.ini file after deployment using scripting tools such as AutoHotKey. See the section on Central-Local Automation.

Font Mapping - Revit does not utilize shape-based font files (SHX) like AutoCAD, rather it uses True Type fonts (TTF). When you are importing; DWG data with text, Revit attempts to map whatever SHX-style fonts it finds to an equivalent TTF using a file called **shxfontmap.txt** which is located in the "Data" subfolder under Revit's installation folder.

In a larger office, it is critical to standardize this file and ensure it is distributed to all Revit users. When used in a worksharing environment where several users are working on local copies of a central file, if one user has a different version of the shxfontmap file, the font mappings within all linked DWG files for the Revit project will be affected when that person opens, works on and saves to central. A standardized font mapping file can be added to the network deployment with the guidelines in the section above.

Export Templates – The text files used for exporting DWG/DXF formats does not have to be located in the Revit installation location, however, it should be managed carefully. Keep these files with your project data so the rest of the team can easily access them, but ***keep your original export layer template in a safe place*** (you may even want to ZIP it) because each time the template is used, it is appended with everything in the current project that needs to be exported. If you are using many DWG or DWF links, the export file can get cluttered very easily.

Sub-Categories in Families – Ensure that any team members responsible for creating content follow a minimum standard of care when using customized sub-categories in families. For example, when using a Generic Model template for elevators, sub-categories can be labeled as any of the following: Elevator,

Elevators, Evtr, Elevator Cab, Elevator Car…all the same content, but are separate and unique categories when loaded into one project.

Also be aware that sub-categories – especially in Generic Models – must be assigned in the export layer template after the families are loaded into projects. If your projects utilize a greater number of custom families, exported geometry will most likely end up on layer **A-GENM** by default.

<u>Model Audits</u>

As BIM workflows become more common, and as we learn to do more with the data contained in a BIM model, it becomes critical that model fidelity/quality be maintained throughout the process, the old saying "garbage in, garbage out" applies to an even higher degree (especially when dealing with quantity take-offs, etc). Unlike 2D drafting Revit lends itself to multiple approaches to solving a variety of problems with regards to virtually constructing a building. Some solutions may be more elegant or better suited to a particular issue, depending upon the context. At the same time, other solutions may simply be "bad" ideas no matter what the context is. It is unreasonable to expect to educate everyone working on a Revit project with regards to every possible technique, most especially when a firm is just starting to use Revit. Therefore it is worthwhile to consider having a "model audit" as part of a project's QA/QC process. In the past projects would be checked for their technical fidelity with regards to detailing (still important!!!) and the accuracy and coordination of the set of drawings. Revit generally removes the issue of a coordinated set; however that can, and should be replaced with an audit of the model by an experienced Revit user not involved with the project. This is essentially "an extra set of eyes" to check on how the model is being built, how well it is organized, etc, and may catch issues that could become problems later, or suggest alternatives to complex or unique conditions in the building. A checklist can help speed this process, and allows for consistency among multiple auditors.

Modeling Auditing Sample Checklist:

3	**Audit Data:**	
4	Date	8/31/2007
5	Auditor's Name	David Spehar
6	Auditor's Office	Cleveland
7	Auditor's Direct Dial	2176
8		
9	**Project Data:**	
10	Project Name	JOHN TYLER COMMUNITY COL MIDLOTHIAN PHASE 2
11	Project Number	06608.00
12	Office Location	Washington DC
13	Phase	Schematic Design
14		
15	**Central File Data:**	
16	Follows Burt Hill Naming Convention	File renamed for audit
17	File Size Before Purge/Compression	41656 kb
18	File Size After Purge/Compression	41788 kb
19		
	General Comments:	The model seems to be well maint quality of the data is good. The te appropriately used 3d and 2d tecl

WARNING DESCRIPTION	COMMENTS
...ighlighted walls are attached to, but miss, the highlighted targets. 5	These warnings do not see
Warning 1	address them to improve
EXTERIOR WALLS : Floors : Floor : Generic - 12" : id 193290	should not have too much
EXTERIOR WALLS : Walls : Curtain Wall : Curtain Wall sd4 : id 634709	behaving correctly che
...highlighted walls overlap. Color fills, room tags and room areas may not beha	
...orrectly. Use Cut Geometry to embed one wall within the other.	
Warning 2	
466393	
EXTERIOR WALLS : Walls : Curtain Wall : Curtain Wall sd4 : id 635234	
Wall and room separation line overlap. Color fills, room tags and room areas	
...not behave correctly.	
Warning 3	
INT - FIRST FLOOR : Walls : Basic Wall : Interior - 8" CMU : id 298832	
EXTERIOR WALLS : <Room Separation > : Model Lines : id 1082098	
The multistory stair/ramp could not reach its top level with integral number ...ights. Maximum number of flights below the top level is created.	
Warning 4	
VERTICAL CIRC : Stairs : Stair : basic stair : id 184681	
Warning 5	
Two elements were not automatically joined because one or both is not editabl	
Warning 6	
EXTERIOR WALLS : Walls : Basic Wall : Foundation - 16" Concrete : id 835255	
EXTERIOR WALLS : Walls : Basic Wall : Exterior - BELT BEAM MTL STUD : id 836264	
EXTERIOR WALLS : Walls : Basic Wall : Exterior - Metal Parapit JTCC SD : id 1033995	
There are identical instances in the same place.. This will result in double counting in schedules.	These warnings should be ID's and resolved to reduc docur
Warning 8	
EXTERIOR WALLS : Curtain Wall Mullions : Rectangular Mullion : Rectangular Mullion 2 1/2" x 6" : id 1026121	
EXTERIOR WALLS : Curtain Wall Mullions : Rectangular Mullion : Rectangular Mullion 2 1/2" x 6" : id 1026420	

Central-to-Local Automation

Using DOS commands in a BAT file:

```
:ArchiveLocal

    if not exist "C:\Revit Local Files\Archive\%PRJ%\*.rvt" (
          mkdir "C:\Revit Local Files\Archive\%PRJ%
          echo.
          echo %PRJ% folder created in Revit Local Files
          echo.
    )

    echo.
    echo Renaming existing LOCAL files to %username%-ARCHIVE
    echo.

    rename "C:\Revit Local Files\%PRJ%\*.rvt" "*-%username%-ARCHIVE.rvt"

    echo.
    echo Moving existing %PRJ% LOCAL files to %PRJ% ARCHIVE
    echo.

    xcopy /y /i /s "C:\Revit Local Files\%PRJ%" "C:\Revit Local
Files\Archive\%PRJ%"
    RD   "C:\Revit Local Files\%PRJ%" /S /Q

:CopyCentral

    echo.
    echo Copying %PRJ% CENTRAL files to LOCAL folder
    echo.

    xcopy "%CEN%*.rvt" "C:\Revit Local Files\%PRJ%\" /y

    echo.
    echo Adding "-%username%" to %PRJ% LOCAL files
    echo.

    rename "C:\Revit Local Files\%PRJ%\*.rvt" "%PRJ%-%username%.rvt"

    echo.


    call "Q:\Revit\Files\Batch Files\2008\RAC2008.bat"
    cls
    @echo off
    echo Done!
    echo Local File created in C:\Revit Local Files\%PRJ%
    type "Q:\Revit\Files\Batch Files\echo.txt"
pause
```

A free keyboard/mouse macro program called AutoHotKey can be found at http://www.autohotkey.com. Such a tool can enhance the central-local automation and offers the ability to make changes to the Revit.ini file when launched.

For additional tips and code for local/central automation, see the AUGI forum thread titled "Transparent local file creation" with input from David Baldacchino and David Kingham:

http://forums.augi.com/showthread.php?t=65897

Project Browser Customization/Managing Views

Learn step-by-step procedures to make efficient use of Revit's Project Browser when working with hundreds or even thousands of views in a single file.

The ability to customize the Project Browser has proven a tremendous asset to our larger projects. We accomplish this customization in a variety of ways. First, sheets can be grouped very simply according to discipline and number grouping. Set the folders in the "Sheet Prefix" browser organization to group by sheet number, using 3 leading characters if your sheet naming convention follows Discipline-Sheet Number.
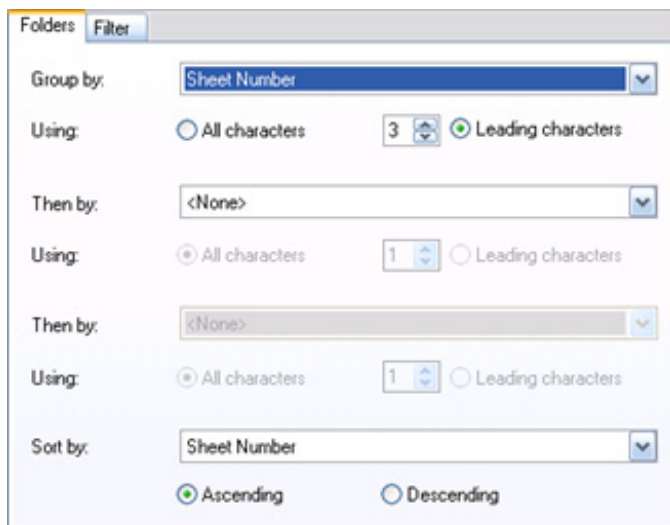
Alternatively, you can create a project parameter called "Sheet Grouping" (Type=Text; assigned to Drawing Sheets), to further clarify the use of sheet discipline and major grouping code:
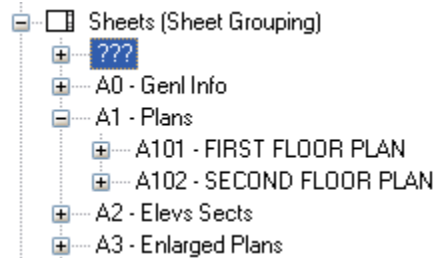
Just be aware that the above method is not automatically assigned to each new sheet. Select multiple sheets in the browser using the CTRL key and edit their properties.

Often during the design process, presentation sheets may need to co-exist with the construction drawings, but viewed by different team members. To segregate these different types of sheets, we create a Project Parameter named Sheet Type which functions as a text field.
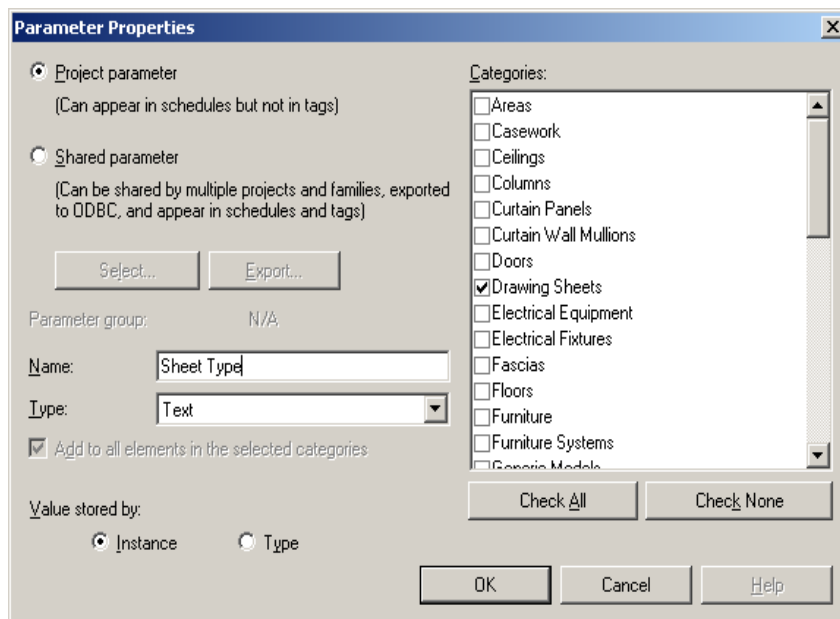
For a particular type of view (for example, Design Sketches), a name is assigned to the Sheet Type parameter for each design sketch. Then, create a Browser Organization with a filter displaying sheets in which Sheet Type equals "Design Sketches".
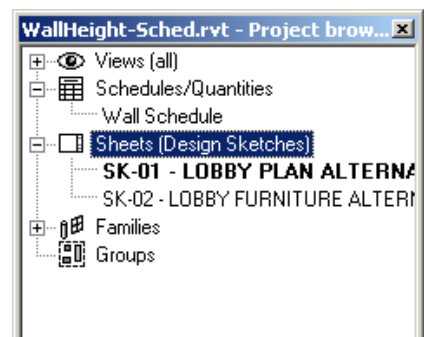
Finally, for large projects in either vertical or horizontal girth, another text-type parameter is added to Views called "Zone." This parameter is used to group views according to their respective portion of the project. For example, a tower may consist of Low-rise, Midrise and High-rise. As described in the previous paragraph, a Browser Organization can be created with a filter displaying views for which the Zone equals a particular text value. In addition to "Zone" a "view type" parameter (similar to Sheet Type) can be useful for segregating views set-up for the purposes of coordination or working in the model, from views intended for documentation purposes.

Another technique for managing views and your project browser within Revit is to make use of View Types. Like any other family within Revit most Views can have multiple types created, and custom properties assigned to each type. This includes the graphical callouts and default view templates of each view type. To create a new view type, select a view in the project browser, and go to its properties, then edit/new and duplicate. You can create as many as you want to address as many conditions as required. In some cases the graphics of the view type may remain the same. This is simply a method of organizing many views into logical structures.
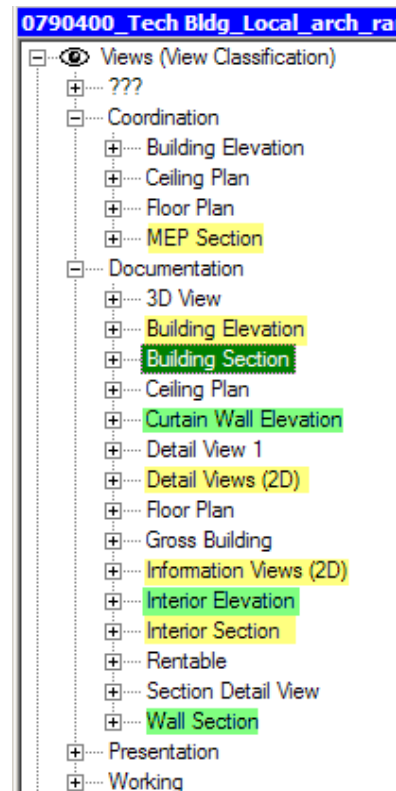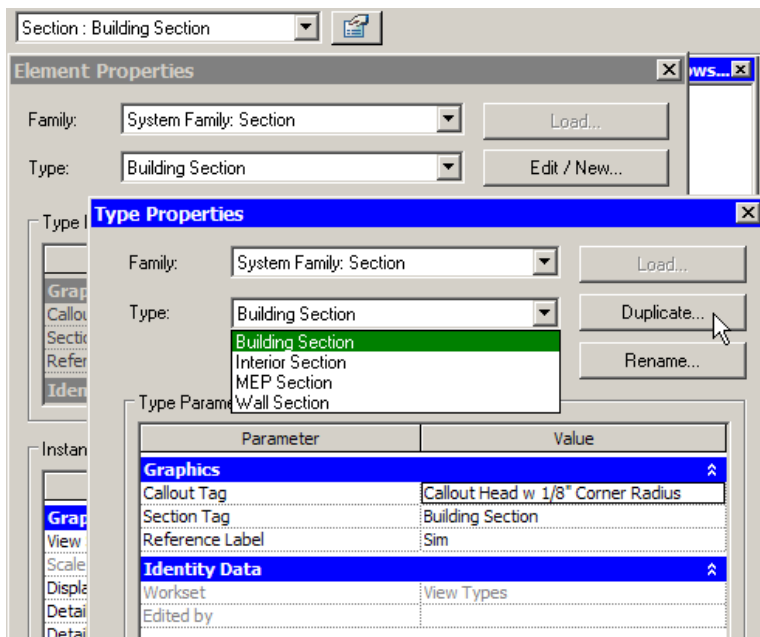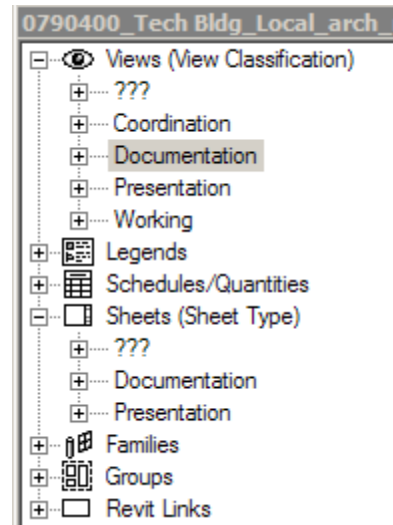
Warning: The types for plan views (Floor, Ceiling, area, etc.) and 3D views cannot be duplicated.

Controlling Views / Drawing Consistency

Best practices and guidelines for keeping the graphical nature of views consistent and getting more information out of your views.

Out of the box the graphical nature of Revit views generally leaves something to be desired, especially as a project progresses into more advanced phases. View templates are key to managing the graphical quality of views, especially when you have numerous views that need to look the same. New view templates can quickly and easily be created by using an existing view that has already been configured as required. Select the view in the Project Browser, and right click on the view, choose "Create View Template From View". You'll notice that you can also apply an existing view template from here, you can CTRL+select multiple views and apply the same template simultaneously.
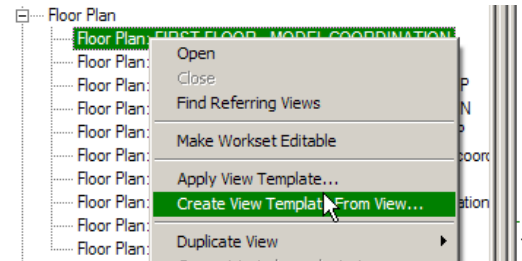
Tips:

- You'll notice that you can also apply an existing view template from here, you can control select multiple views and apply the same template simultaneously.

- View templates can also be created and modified from the View templates menu found under "Settings".

- Keep in mind that view templates are static, if you modify or update a view template you will have to re-apply it to all views that it pertains to.

- View templates will override all settings, changes or overrides previously applied to a view.

- You can update a view template from a view by "re-creating" the template with the same name. Revit will ask you if you want overwrite the existing template.

- View templates allow you to control the visibility of links. This is especially key when working with Revit Structure & MEP models, as you probably don't want/need to see all the information those models contain.

Dependent Views
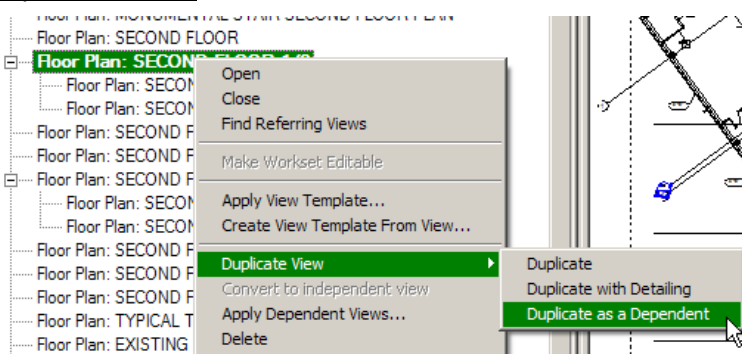
View templates become ever more useful when you start creating dependent views. Dependent views create "child" views based on the original parent view. The dependent views sit under the parent view in the Project Browser tree. You need only apply the view template to the Parent view and the changes will propagate to the child views.

- When create a View Reference Tag, you need to start with a generic annotation, then change the Family Category

- When placing a view reference, make sure to choose the correct view to reference from the selector to the right of the Type Selector

- Matchlines are their own object and category (under the View toolbar) their visibility and graphic style can be controlled from Object Styles under Annotations.

<u>Filters</u>

In addition to using graphic overrides in combination with view templates to change the way views look, filters are a great way to maximize the information conveyed by a graphical view. Filters are managed under the Settings menu → Filters. Filters function similarly to the filters in a schedule in that they allow you to define specific criteria by which to isolate objects. Filters can apply to multiple objects in multiple categories. When used with graphical views filters allow you to override the graphic qualities of the filtered objects. This means that you can do something as simple as turn off the objects identified by the filter, or you can highlight the objects in some way.
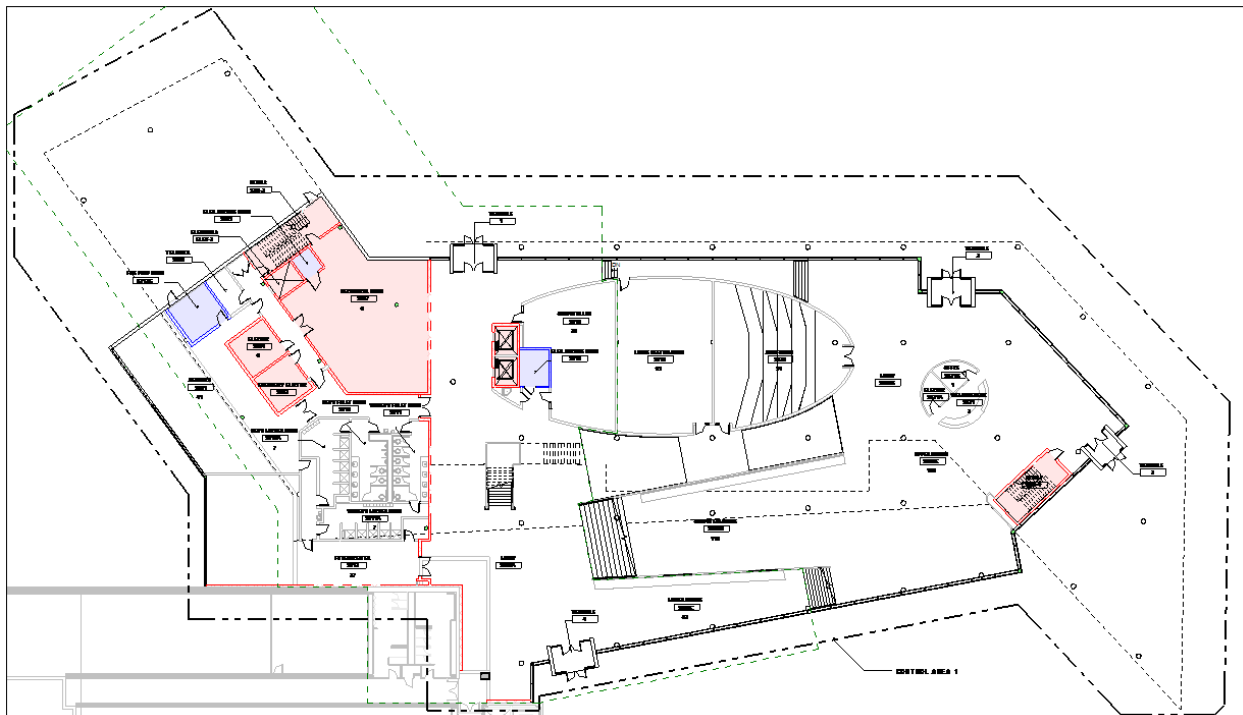
Example:

Isolating rated walls, filters are created for the ratings in the building, and overrides are set, another filter is created to isolate non-rated walls.

Resulting in a view that looks like this:

*note: color schemes by room used to indicate rooms that require ratings

This view is useful both for review by code officials, but also for a senior team members to review to assure that rated walls have been specified where required, and not anywhere where they are not

required. The same application of filters could occur in a section or elevation to help assure the continuity of fire ratings vertically through a building. Filters could be used to correlate graphical information with schedule information, where everything in the schedule is emphasized graphically and everything not in the schedule is either turned off/or half-toned, etc…

Workset Configurations

Best practices and guidelines for using worksets to your advantage on large projects with large teams. Learn techniques to organize data and conserve system resources.

Early problems in Revit implementation usually stem from improper team structure. Because Revit utilizes a model-based approach to design and documentation, the traditional drawing-based roles become obsolete. Project teams must focus on assemblies of building components rather than plans, sections, elevations…

To this end, Revit allows a project of any size to be organized according to the structure of the team. Following are some examples of worksets used on large scale projects:

Large Vertical Building	*Large Campus-Type Project*
Exterior Enclosure	Existing Structure
Core	Existing Partitions
Interior Walls 1, Interior Walls 2, …	Structure-Part A, Structure-Part B, …
Furniture 1, Furniture 2, …	Enclosure-Part A, Enclosure-Part B, …
Telecom 1, Telecom 2, …	Core-Part A, Core-Part B, …
Structure-Foundation	Partitions-A1, Partitions-A2, …
Structure-Podium	Partitions-B1, Partitions-B2, …
Structure-Tower	Datum-Grids
Datum-Grids	Datum-Levels
Datum-Levels	Site
Floors-Vertical Openings	
Site *(Often a separate model)*	

With this type of workset structure, team members have the ability to open discrete portions of the virtual building. Using File-Open, you are presented with the option to specify which worksets you would like to open, thus limiting the amount of data loaded into memory.

TIP: Use "Workset1" as a temporary workset. Instruct your teams during training to use Workset1 when they are not sure on which worksets to place new modeling elements. A dedicated 3D view with only Workset 1 visible can be used to assign elements on Workset1 to a more appropriate workset.

TIP: Running out of memory may cause the error "Unable to save" or "File not found." This can be remedied by closing major worksets, causing Revit to release a percentage of virtual memory.

BONUS TIP: The free utility, Google Desktop allows you to add gadgets such as the System Monitor.   This is a floating or dockable, real-time gauge of your RAM and CPU usage.
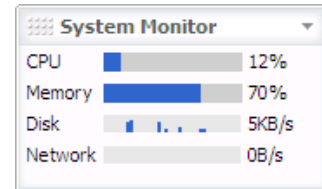
Keynoting

The default Revit Keynote file follows the CSI divisions to a high level of accuracy, which can be less then useful. However it is possible to quickly create your own keynote file. This file can be simple, and its **usefulness** is **coordinating** common notes **across** a whole document set, or when you have multiple model files for a single project. It even makes sense to have the person in charge of writing the specifications manual to also maintain the keynote file, this way your notes closely match the **verbiage** used within the project specification**.**

TIP: Keynotes can be assigned to objects, materials, or user defined within a specific view

Create a keynote tag family that has at least three types left justified text and right justified text and center justified. You'll have to make use of a visibility parameter.

Linked Models

Dividing a large project using several linked Revit models.

Why divide?

Although Revit's principles are derived from a single, coordinated source of data, it is sometimes necessary to consider a scheme to divide a project into several parts. Such a division is most effective when planned earlier in the life of the project. When planning to divide a project into multiple Revit files, consider the following important factors:

- Team structure – if your project teams will be working in different offices or on uniquely divided portions of the project, linked models might be a viable alternative.

- Project components – how the building is divided into parts such as a tower's podium, sub-grade areas, unique features…

- Document issues – separately defined sets of drawing packages can help prepare your division of project files. If packages such as structural steel or curtain wall are to be issued, these building components might be better modeled and documented in separate models.

How to divide?

Begin by choosing one project as the source for coordinate system, grid lines and levels. Sometimes it might make sense to use this source model solely for datum management. Next your linked models should be placed on their own worksets, or one workset for each linked model. If you have multiple instances of a linked model, the workset under the link's Type Properties should be set to one workset, and each instance can either be on its own workset or another common workset.

Example:

A structural engineer is designing for a large, multi-wing office complex. They submit several models, one for each *TYPE* of wing and there are several instances of each type of wing. The workset Type Properties for all of the structural linked models are specified as "Link-Structure" and each instance is specified as "Link-Wing A", "Link-Wing B", etc. This allows the flexibility to close or hide either all the structural links or an entire wing.

Linking, Copy/Monitoring…

Platform Versions

For efficient and effective collaboration as we will demonstrate in this example, each partner MUST be on the same platform version of Revit. These platform versions are dictated and best referred to by the version of Revit Architecture to which they correspond.

Product Builds

It is recommended that within each product, all people collaborating be on the same build. Identifying what build you are using is very simple. Go to the **Help** menu and select **Product and License** Information. You will see a dialog box like this with the version and build information:
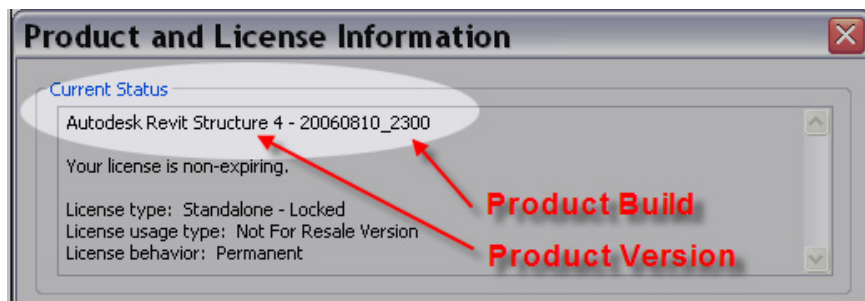
*Note: Within the same firm, it is **required** that all people working on the same project using work sharing be on the same build. Different builds can cause Save to Central issues.*

Use the coordination tool Copy/Monitor to intelligently translate information between linked Revit models.

<u>Coordination Monitor Guidelines</u>

When using coordination monitor, there are some general guidelines that should always be followed.

- Use the Copy and Monitor functions sparingly, and only when the linked result is specific to the coordination process. Unnecessary links and relationships can slow linked model performance substantially.

- When worksharing is involved, coordination monitor should be implemented as follows:

  o When the files exist on the same LAN and direct access is possible, coordination monitor should always be set up Central File to Central File. Updates should occur at a time when no one is working from a local file and access can be restricted.

  o When the files are being distributed to other consultants, make sure that the model has been opened and **detached from the central file** before distributing. This detached file should then be set up direct to the central file at the other discipline.

- Remember, certain relationships might be better as only a Monitored relationship, not a Copy/Monitor.

For more detailed instructions on using Copy/Monitor with any combination of Architecture, Structure, and/or Mechanical workflows, please see my documentation for the Revit Power Track class AB104-2P "Effective Collaboration with the Revit Platform" which will be available on AU Online.

Cross-Platform Interoperability

A look at processes to include geometric information from other software platforms in the case of structural coordination, unique massing, and ultra-custom component creation.

Quite frequently, we architects will collaborate with structural engineers on a number of projects. In my experience, structural engineers use a wide range of engineering tools to get the job done – including Bentley Structural. We can't use Revit in this scenario, right? … Wrong. Let's look at how we can use 3D data from a DGN file.

DGN is one of the supported file types Revit can import and export; however Revit can only read up to V7 DGN files. If your engineer is using the latest V8 Bentley software, they will have to save their files down to V7 format before transmitting.

Integrating 3D DGN data is quite similar to importing DWG data. Simply use File→Import DWG/DXF/DGN and find the file.

Remember: You must create an in-place family (Modeling→Create) in which to import the 3D DGN file. If you don't, it will not cut or display properly throughout your project.
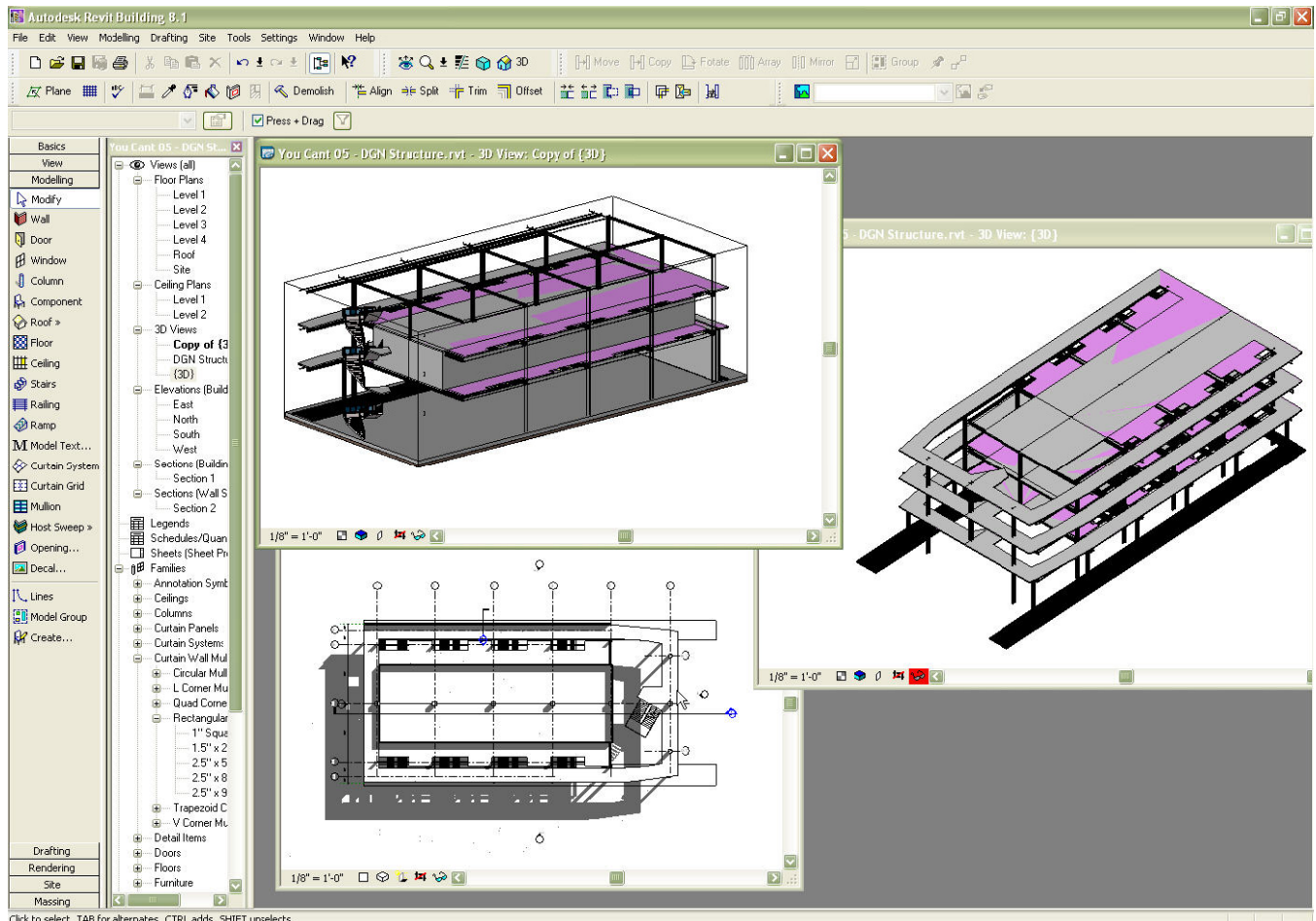
The one thing you can't do with DGN structure is use the Interference Check tool to detect clashes between the 3D DGN model and the Revit components; however, see my other AU Revit Power Track class "**Effective Collaboration using the Revit Platform**" for tips on using IFC models.