Scrub, Tina, Scrub! An Oregon State Hospital Case Study in Keeping a Clean Autodesk® Revit® Model

Thomas Whisker - HOK

AB2761

This class shows a case study of Oregon State Hospital in Junction City, Oregon. It is the second site of a 2-campus hospital replacement project for the Oregon State Health Authority and is led by the HOK–San Francisco office along with SRG Partnership in Portland. This class covers the challenges of sharing a project between 2 firms over the course of several years. We discuss the best practices for keeping a model clean, lean, and organized so that it may be used effectively by a large team over the Internet. We show how to efficiently categorize and maintain views, schedules, sheets, families, and worksets. Also of importance is the use of view templates for maintaining consistent documentation in multiple models. Focus is given to consistent model purging and warning cleanups. We also talk about methods of communication among internal and external teams, consultants, and contractors using tools such as a project execution plan (PxP), best practices documentation, and Autodesk® Navisworks® software.

LEARNING OBJECTIVES

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

- Apply best practices for working in a shared model with a partner firm via Citrix® server.

- Apply best practices for keeping your browser lean and organized, making it easy to use and find what you need quickly.

- Apply best practices for synchronizing your model among numerous team members in multiple locations.

- Apply best practices for communicating project work plans and workflow with all team members.

ABOUT THE SPEAKER

Thomas is a Licensed Architect and LEED Accredited Professional. His project management skills & passion for Building Information Modeling has led to a career as a Job Captain, BIM Manager, and 3D modeler/designer. Prior to architecture, he spent over 15 years in publishing operations where he focused on customer service, data analysis, and business process development. He holds a BS in Marketing from SUNY Oswego and a Master of Architecture from University of Oregon. Thomas currently works with project teams at HOK in successfully leveraging the information in BIM throughout all phases of the design and construction process.

Email: thomas.whisker@hok.com

OREGON STATE HOSPITAL – JUNCTION CITY

Junction City Campus

Junction City is the second site of a two campus Mental Health Hospital Replacement project for the Oregon State Health Authority. The 90 acre site is located 100 miles south of Portland in the Willamette Valley. The site which is owned by the Department of Corrections, happens to be located in a flood plain, which required a buildup of structural fill that was anywhere from 2 to 6 feet in some locations.
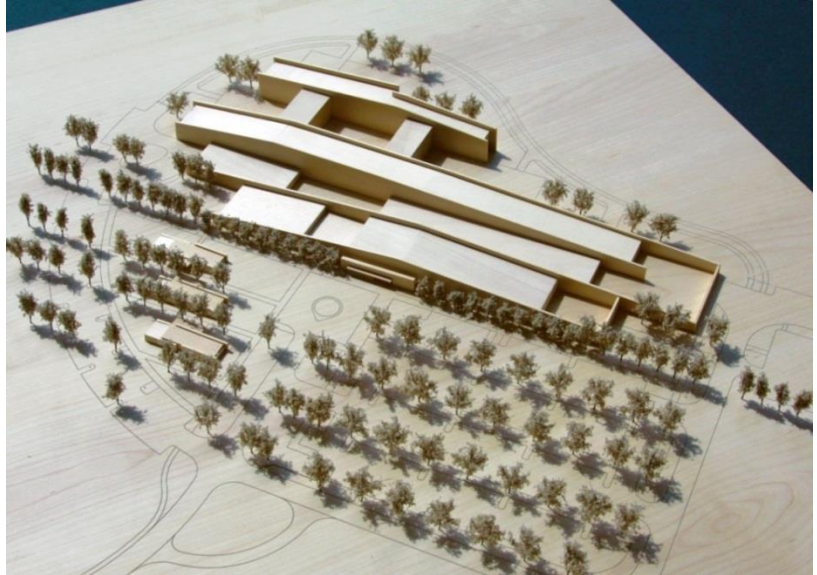

Salem Campus

Salem, OR is the location of the first campus that was built. The Kirkbride Building located in the upper right hand corner of the photo was the only building to remain from the original hospital. It was the basis for design as well as the filming location for One Flew over the Cuckoo's Nest. This was one of the first large-scale BIM projects in the San Francisco office and that experience helped guide some of the choices that were made on Junction City.

The Budget

The Junction City budget shrank from an initial amount of $125M to the current $84M. This was due in part by the increase in construction costs on the Salem project. It was also impacted by

the requirement of a one story structure which would have needed a very large footprint. This proved to be costly because it required numerous finished courtyards and lots of structural fill. The project went back to programming several times and restarted for a 4th time in September of 2011.
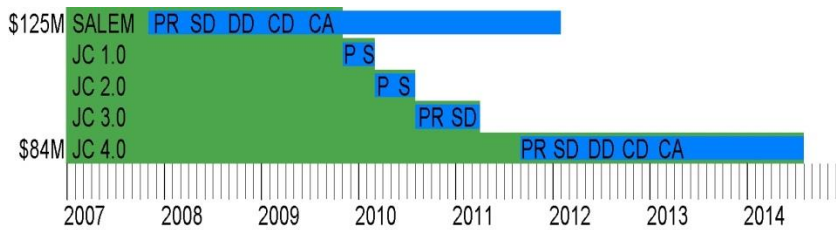
The Design

The focus of the final design was on compacting the building footprint as much as possible. The concept of relating the buildings mass to the surrounding mountains and valleys resulted in a scheme of 3 bars as the mountains and the space between them as the valleys. Patient housing in the northern bar connects to treatment facilities in the center bar. The southern bar houses hospital administration and operations. There are also 3 cottages referred to as RTF for Residential Treatment Facility. This is where patients lived prior to ending their treatment and going back into the world.
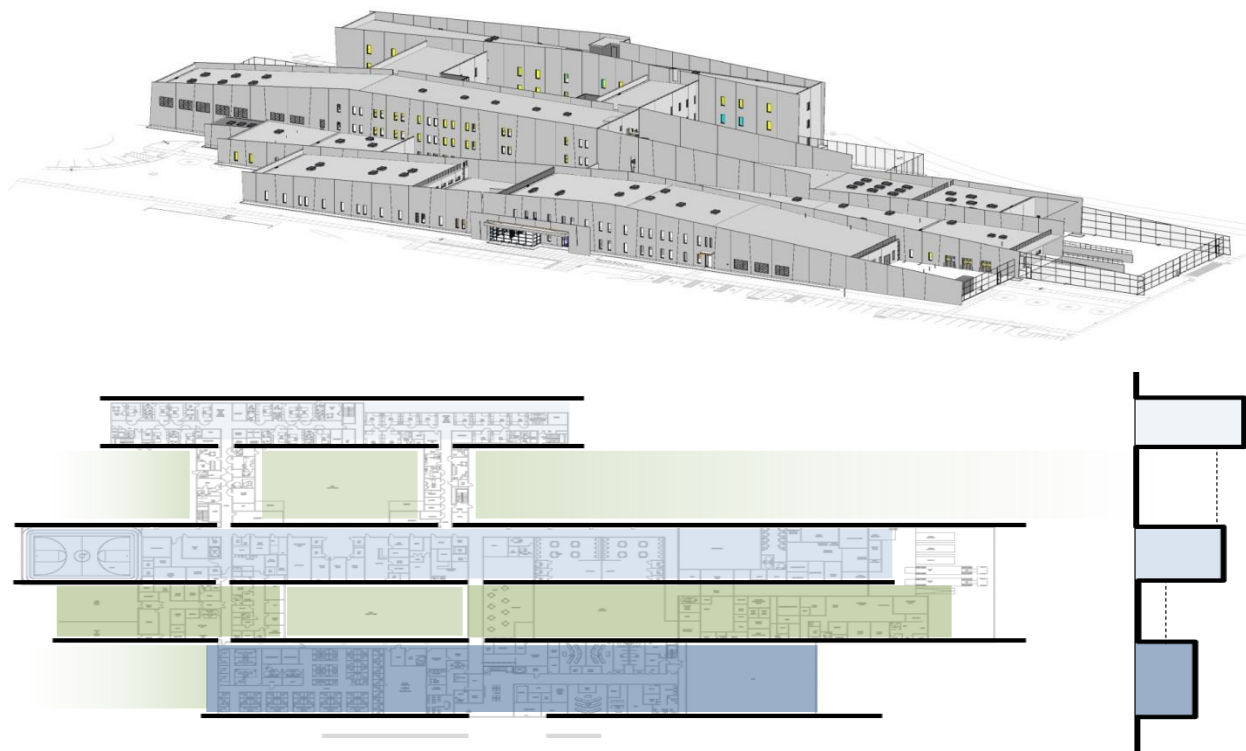
The Design Team

The project required a local architect. SRG Partnership in Portland worked jointly with HOK on both campuses. As the lead firm, HOK was responsible for the design and took on most of the work at the beginning of the project. As each phase progressed, the scope of responsibility shifted from HOK to SRG. Their responsibility increased with the goal of SRG handling CA just as they did on Salem. The diagram here shows the split during CD phase.
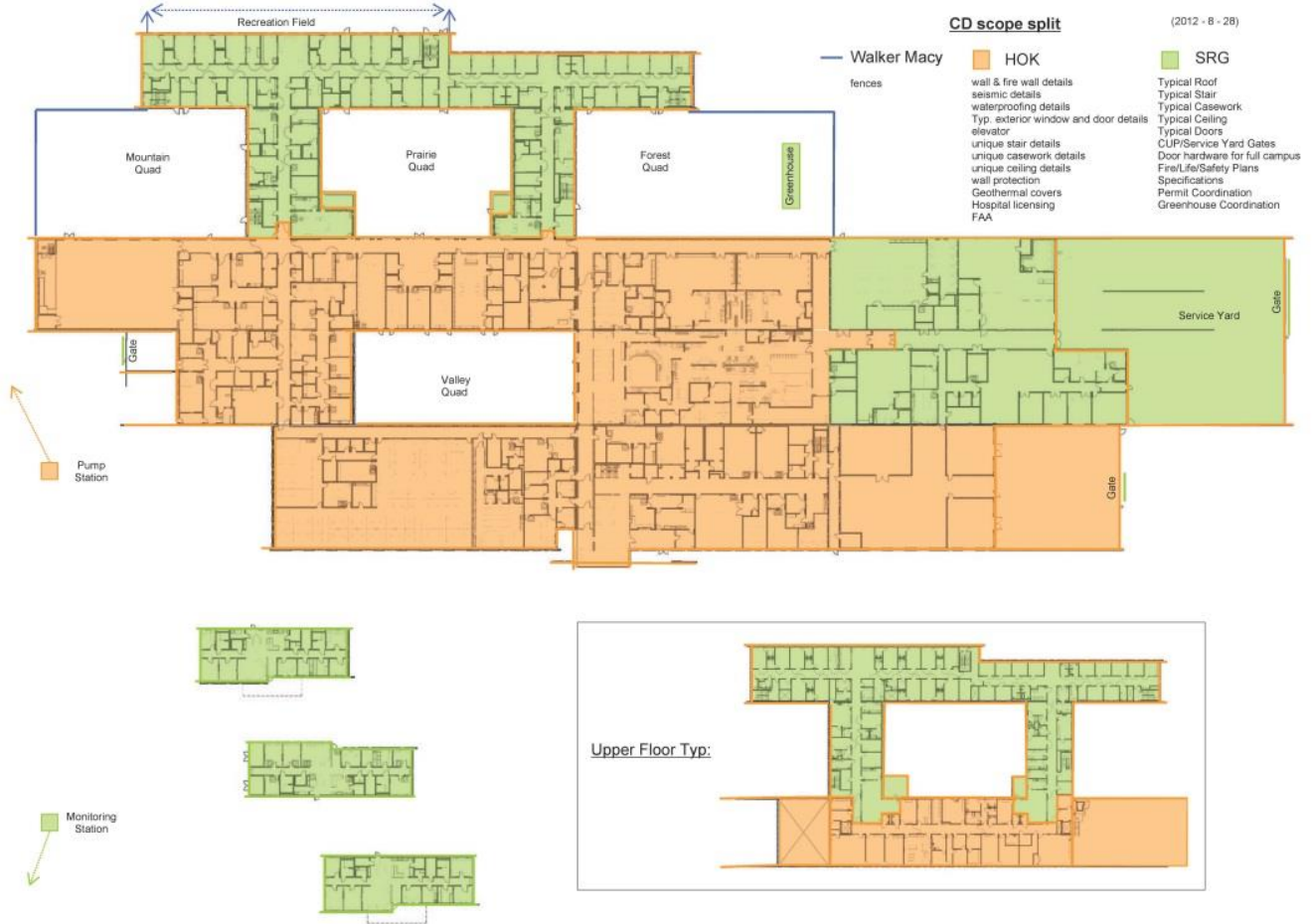

PHASE	HOK	SRG
SCHEMATIC DESIGN	75%	25%
DESIGN DEVELOPMENT	75%	25%
CONSTRUCTION DOCUMENTATION	50%	50%
CONSTRUCTION ADMINISTRATION	00%	100%

The Challenges

- Multiple Revit Versions – 2007, 2008, 2009, & 2012

- Inheriting Old Processes & Families

- Restarting Project With New Team Members

- First Time & Non-Revit Users

- Working & Sharing Models with Partner Firm (SRG)

- Citrix on Gen-1 Server With 18 Users

- BIM Coordinator New to HOK

Information Flow

On a bi-weekly schedule, which was the week after the bi-weekly coordination meeting, Revit models and CAD backgrounds were exchanged with our consultants via New Forma. All of our files were saved on the Citrix server in San Francisco, which could be accessed through the internet. During the last few weeks of a phase, we shared models more frequently.
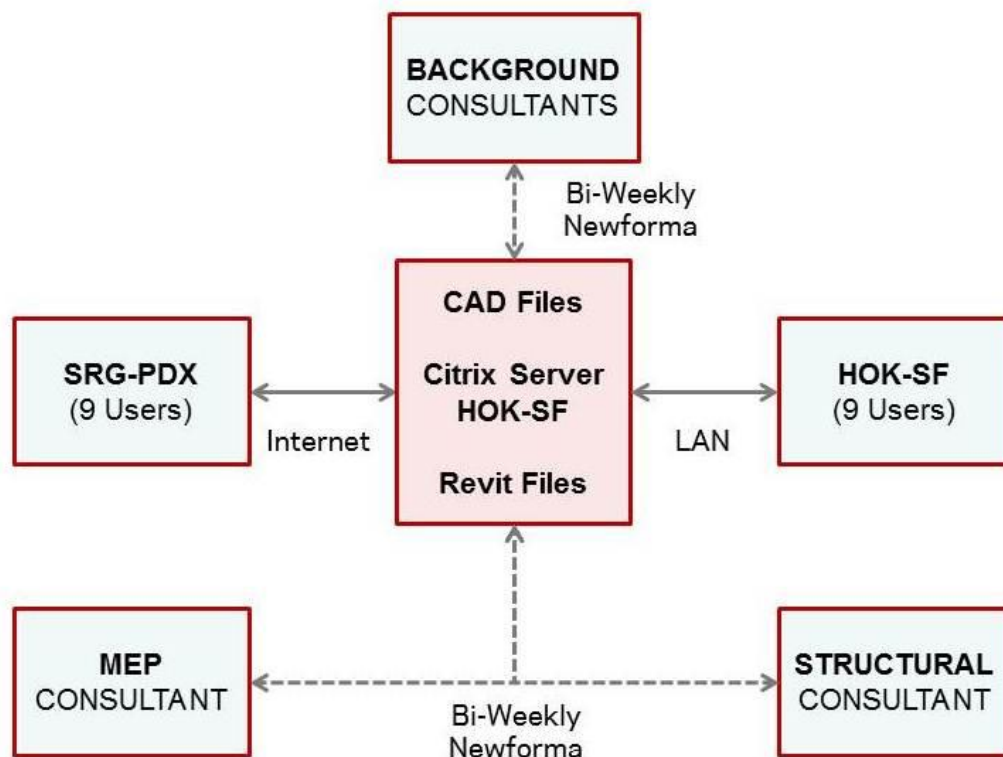
Information Organization

Based on the Salem experience of numerous models, we opted for a single model approach. We planned to create separate models for furniture, equipment, and cottages if things got sluggish. At the end of DD, two linked models were created for FFE and RTF. Two Civil CAD files were used to create Revit components for topography, roads, and landmarks. This Site Model was linked into the architectural composite. We created a file to normalize drafting details that were brought in from multiple sources.   All models were linked into a presentation model which was used for all diagrams and 3D views. This allowed the composite model to contain only production work and 95% of the sheet set.
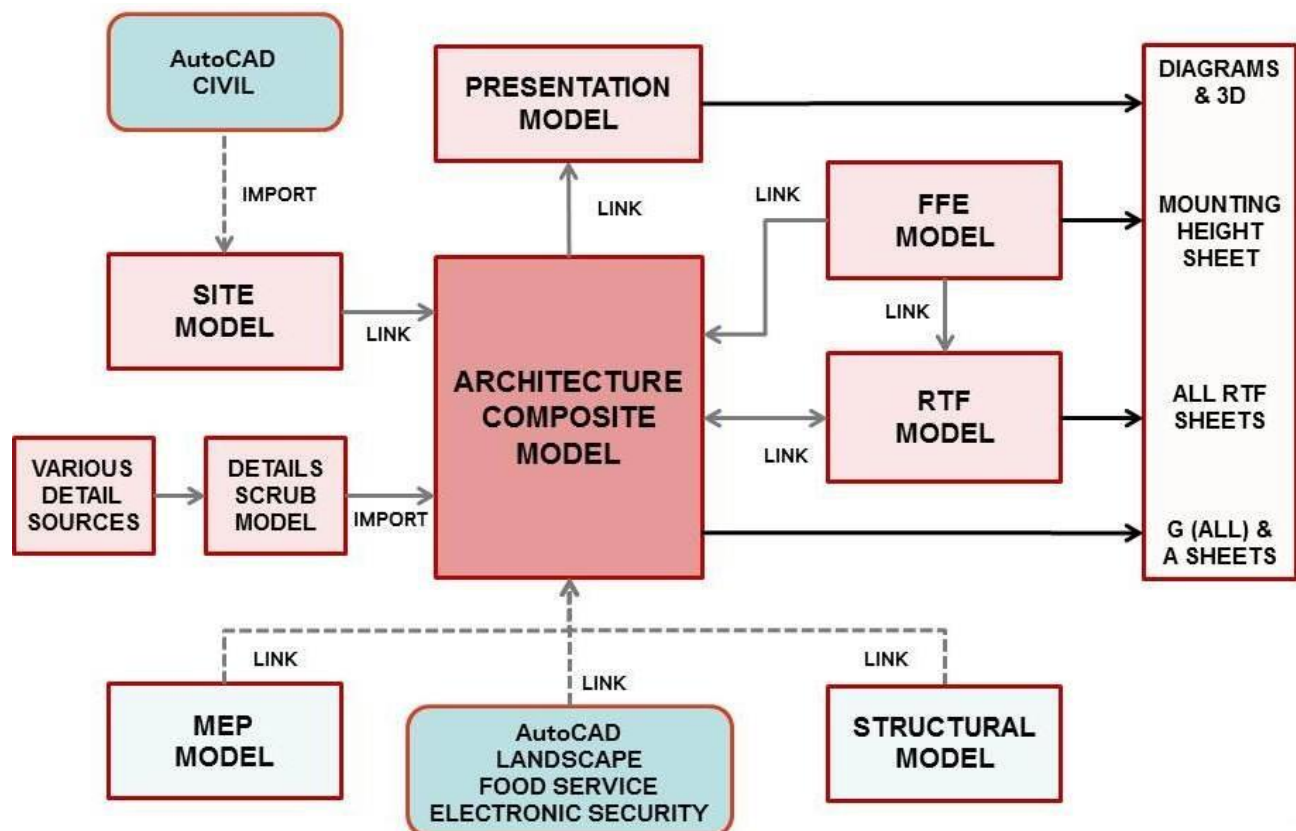
BEST PRACTICES

Project Metrics

These are some of the metrics we wound up with. We kept views not on sheets to a minimum. We did have way too many walls – but that was an inherent process and we dealt with it as best we could. Warnings were low because we had them cleaned out on a regular basis. We also kept links and groups to a minimum.

|			
File Size	326MB	System Family Types	
Project Stories	3	Walls	±307
Area	± 223,000 SF	Ceilings	±15
		Floors	±11
Number of Project Views	±1742	Roofs	±22
Floor Plans	±255	Stairs / Railings	±15
Ceiling Plans	±47	Family Components	±457
3D Views	±33	Groups	
Elevations	±529	Detail	**±50**
Sections	±108	Model	**0**
Drafting	±804	Room separation lines	±49
Views NOT on Sheet	**±62**	DWG imports	**3**
Schedules	±60	Revit links	5
Reports	0		
		Warnings	**18**
User Created Worksets	±20	Room Sep Lines & Walls	11
		Duplicate Type Marks	7

Worksets

We broke up the building based on firm scope & level so that the sets were manageable. We kept the number of worksets low so as not to be confusing. An underscore was added to all non-building component worksets, which allowed them to rise to the top of the list. This list was fixed by the BIM Coordinator.

|	
_Link-AutoCAD	NON-Revit Consultant CAD Plans
_Link-Revit-FFE	Revit - Furniture, Specialty Equipment
_Link-Revit-MEP	Revit - Mechanical, Electrical, Plumbing, & Lighting
_Link-Revit-RTF	Revit - Core/Shell & Interiors for RTF Buildings
_Link-Revit-Site	Revit - Site Context & Topography
_Link-Revit-Structure	Revit - Steel Framing & Foundations
_Room Separator Lines	Room Separation Lines
_Reference	Scope Boxes & Reference Planes
_Shared Levels and Grids	Levels & Grids
_Workset1	Miscellaneous
INTERIORS – HOK LEVEL 1	Casework, Ceilings, Interior Doors & Windows, Plumbing Fixtures, Rooms, & Interior Partitions by Level & Firm Scope
INTERIORS – HOK LEVEL 2	
INTERIORS – HOK LEVEL 3	
INTERIORS – SRG LEVEL 1	
INTERIORS – SRG LEVEL 2	
INTERIORS – SRG LEVEL 3	
CORE & SHELL	Exterior Doors & Windows, Tilt-Up/Shaft Walls, Roof
SITE	Exterior Building Components (Fencing, Bollards, Etc...)
STRUCTURE	Slabs & Temporary Steel Framing
VERTICAL CIRCULATION	Stairs, Ramps, Railings, & Shafts

Organization

Grouping Views & Sheets

We used a project parameter to group views and sheets together. We kept the view groupings to a minimum (PRODUCTION, Working, Coordination, & Reference). Sheets are grouped in the browser in the same manner as they are grouped in the sheet index. The grouping was based off the discipline number and the sheet number. You could then easily find the sheet you want to work on.
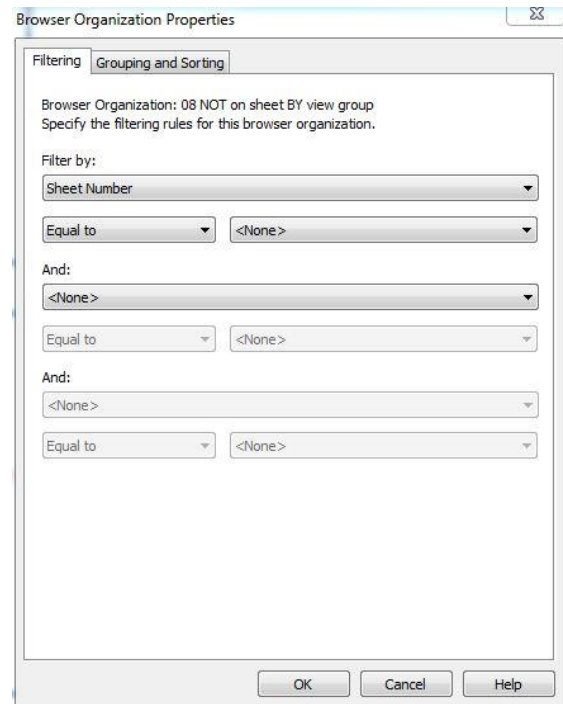
Hide Views on Sheets

We filtered out views that were placed on a sheet. This forced users to go to the sheet for production work. It allowed you to see how it looks and fits on the sheet. You can confirm that objects and annotations are not creeping into the titleblock or adjacent views. It also made people more aware that they were in a production view and to be careful with what they put in it.
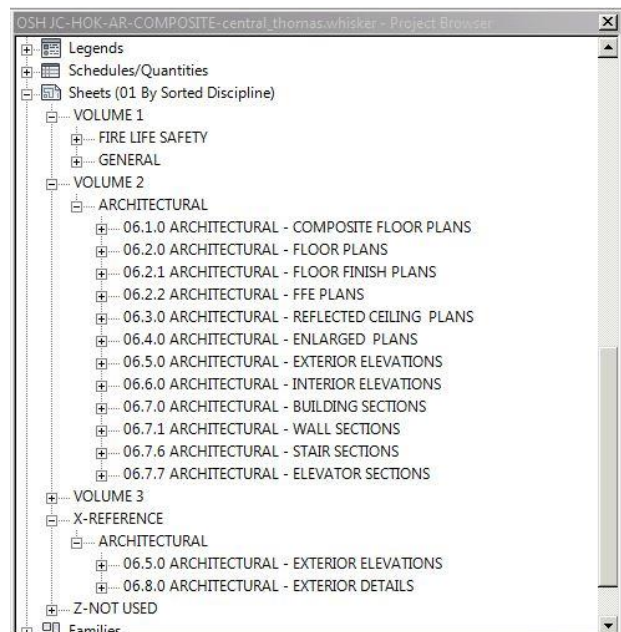
Working Views

Work that individuals created for their own work were all labeled with _WK and their INITIALS. This could include things such as views, filters, materials, reference planes, schedules, and view templates. It allowed users to create what they needed for their own work, identify it, group them together, and bubble to the top of the list. If the work was found to be useful for the project, it was renamed with an OSH and used as part of our regular production workflow. The BIM Coordinator no longer has to ask around about the ownership of work.
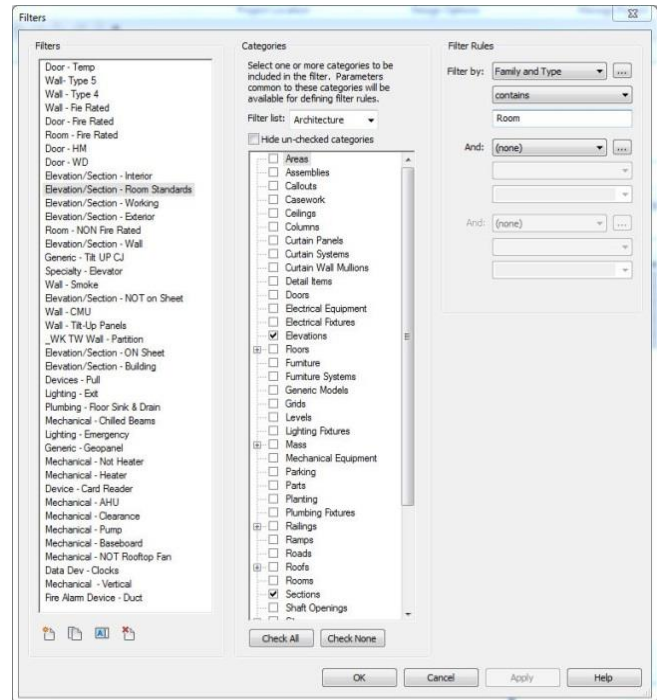
Naming Conventions

We have all seen models with lists of information that were meaningless and jumbled. In this project, every type of information had a specific nomenclature to follow. Live like there's no tomorrow. Just make sure to label things in Revit like you will not be around for it either. Most things started off with OSH, represented project best standard to follow. It made finding things easier.
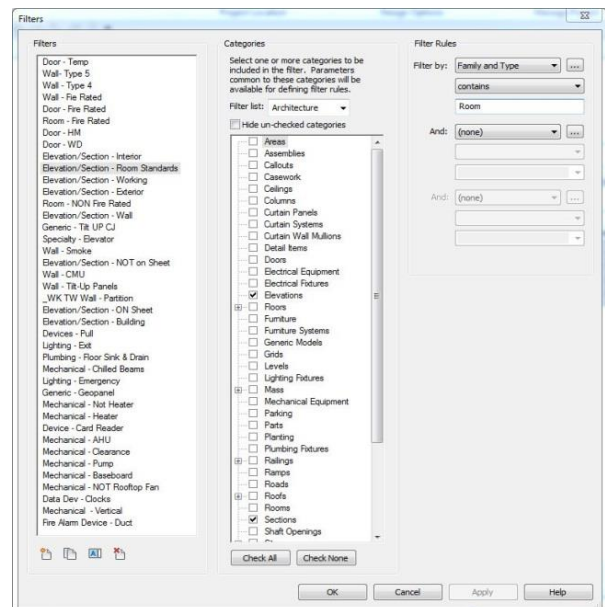
Information Management

Schedules

Schedules were created for certain object categories, which highlighted the critical parameters that had to be filled out. All too often, users become overwhelmed with the amount of information in a model and all the parameter information that needs to be captured. Because of this, they tend to not fill anything out. These schedules highlighted the important stuff that was required for the project. In some cases where we needed to store a value for a tag such as with occupant load. We utilized conditional formatting to make sure the information was correct.

<*Working- LF - Room Occupancy - LEVEL 3 - CODE A>										
A	B	C	D	E	F	G	H	I	J	K
OSH Building Num	Number	Name	Area	Occupancy	OLF	Load	Calculated Load	Load Check	Level	Code Area Group
5	M3501	ACTIVITY	827.93 SF	ASSEMBLY UNC	15	56	56	YES	LEVEL 3	A
6	F3602	ACTIVITY	634.56 SF	ASSEMBLY UNC	15	43	43	YES	LEVEL 3	A
6	F3605	CHART	283.38 SF	OFFICE	100	3	3	YES	LEVEL 3	A
3	T3320	CHART	401.50 SF	OFFICE	100	5	5	YES	LEVEL 3	A
5	M3516	CHART	393.61 SF	OFFICE	100	4	4	YES	LEVEL 3	A
5	M3535	COMMON AREA	365.14 SF	ASSEMBLY UNC	15	25	25	YES	LEVEL 3	A
6	F3631	COMMON AREA	166.57 SF	ASSEMBLY UNC	15	12	12	YES	LEVEL 3	A
5	M3509	CONS	179.13 SF	ASSEMBLY UNC	15	12	12	YES	LEVEL 3	A
3	T3311	FITNESS	620.76 SF	EXERCISE	50	13	13	YES	LEVEL 3	A
3	T3305	GROUP LG	809.59 SF	ASSEMBLY UNC	15	55	54	NO	LEVEL 3	A
3	T3339	GROUP LG	734.45 SF	ASSEMBLY UNC	15	49	49	YES	LEVEL 3	A
3	T3307	GROUP SM	427.88 SF	ASSEMBLY UNC	15	29	29	YES	LEVEL 3	A
3	T3309	GROUP SM	425.24 SF	ASSEMBLY UNC	15	29	29	YES	LEVEL 3	A
3	T3331	GROUP SM	388.63 SF	ASSEMBLY UNC	15	26	26	YES	LEVEL 3	A
5	M3505	KIT	170.99 SF	VOCATIONAL	50	4	4	YES	LEVEL 3	A
6	F3606	KIT	143.38 SF	VOCATIONAL	50	3	3	YES	LEVEL 3	A
5	M3538	LNDRY	162.61 SF	VOCATIONAL	50	4	4	YES	LEVEL 3	A
6	F3622	LNDRY	152.96 SF	VOCATIONAL	50	4	4	YES	LEVEL 3	A
5	M3531	LNDRY	165.83 SF	VOCATIONAL	50	4	4	YES	LEVEL 3	A
5	M3520	MEDS	133.84 SF	OFFICE	100	2	2	YES	LEVEL 3	A
6	F3632	MEDS	121.40 SF	OFFICE	100	2	2	YES	LEVEL 3	A
3	T3325	MEDS	130.40 SF	OFFICE	100	2	2	YES	LEVEL 3	A
3	T3335	NIGHT PHARM	102.68 SF	OFFICE	100	2	2	YES	LEVEL 3	A
6	F3614	PAT PRVT ADA	182.86 SF	INSTIT-SLEEPING	120	2	2	YES	LEVEL 3	A
5	M3513	PAT PRVT ADA	221.86 SF	INSTIT-SLEEPING	120	2	2	YES	LEVEL 3	A

View Templates

Every type of production view had a corresponding view template. An excel spreadsheet was created for each template with all possible switches indicated. This was reviewed with the Project Architects from both firms and the templates were "stored" in a separate project template file for safe keeping. At the end of each phase, "Transfer Project Standards" was used to import the stored view templates. This acted as a safeguard in case anyone had made unauthorized changes to the view templates in the project file.
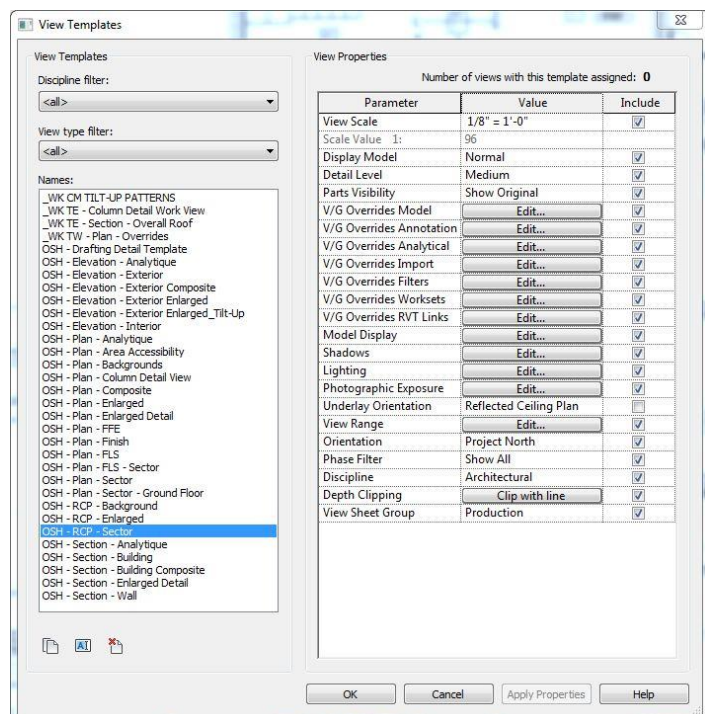
Linked Information

In order to minimize exporting and importing sheet information with consultants, the index used linked sheet information from consultant models. Consultants were given a shared parameters file along with the titleblock and required to fill out Volume, Discipline, and Sorted Discipline Group along with Sheet Name and Number. We only had to import sheet information for AutoCAD consultants which was sent to us a week before each deadline.

Embedded Information

A typical workflow for fire tape is a manual process of using fire tape annotations that are grouped and replicated on numerous views. The problem with this process is that it is manual and not coordinated. We used the walls fire rating to determine the appropriate pattern used for a walls course fill pattern. This allowed us to show fire tape patterns in both plan and section in any view that we wanted to include that information. If we changed a walls fire rating, the fire tape changed automatically.
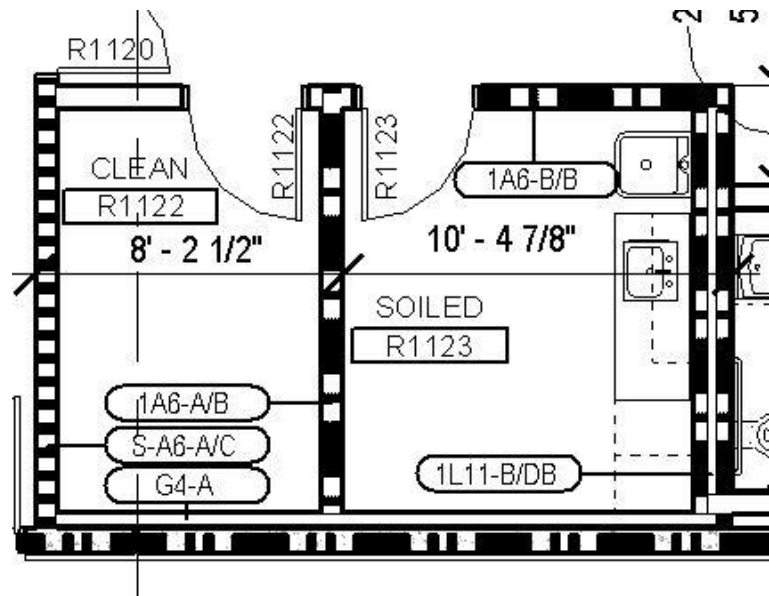
Maintenance

Worksets

Because we had such a large team, breaking up the model in small subsets was critical to improving model efficiency. Team members did not however use the correct workset at times. 3D Coordination views were used to highlight objects not placed in the correct workset. This allowed a quick and easy way to select them and move to correct workset.
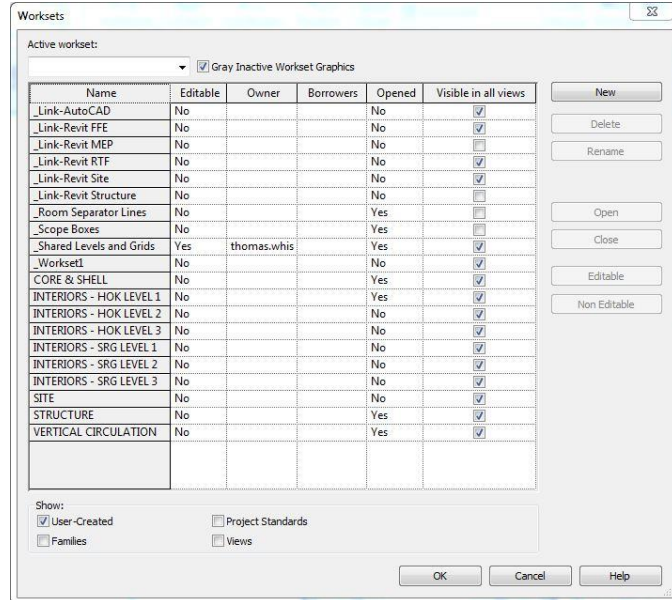
Take Out the Trash

Every other week before models were exchanged, the model was cleaned up to remove unwanted and non-compliant objects, views, and sheets. At this time the following were deleted:

- Views & Sheets that did not have a View Sheet Category - ????
- Views that started with "copy of"
- FamilyXX
- Views with default names - Section##, Elevation #-x
- Reference planes without comments
- Groups & Arrays
- Unapproved in-place families
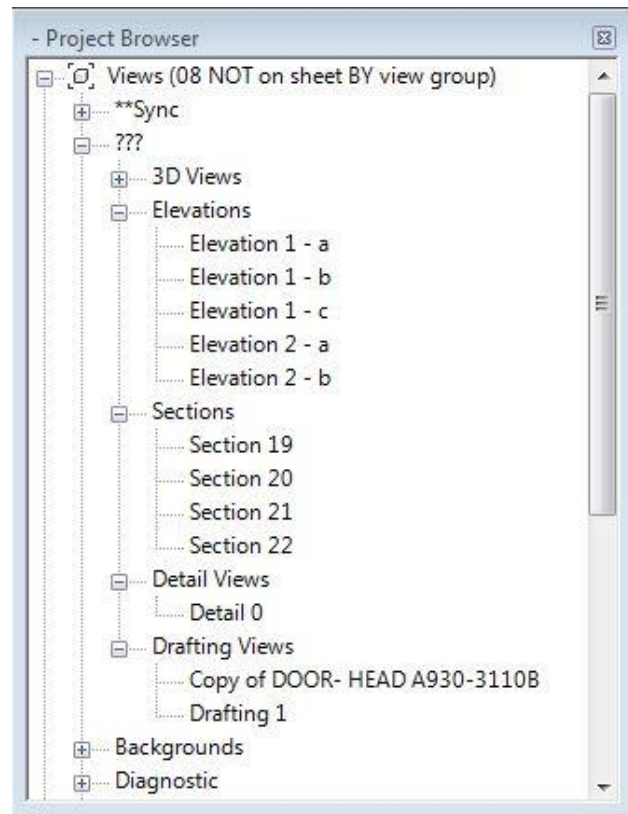
Purge

At each background issuance, a purge was run to clear out unused families and materials. A manual purge was also done to remove all materials that did not have OSH prefix. Most of these are brought in with the importing of families. If you wanted to use the material, it had to be properly named. There was also a manual process of cleaning up line types at the end of each phase. This involved matching up similar line types and changing the type to the one with the conformed name.
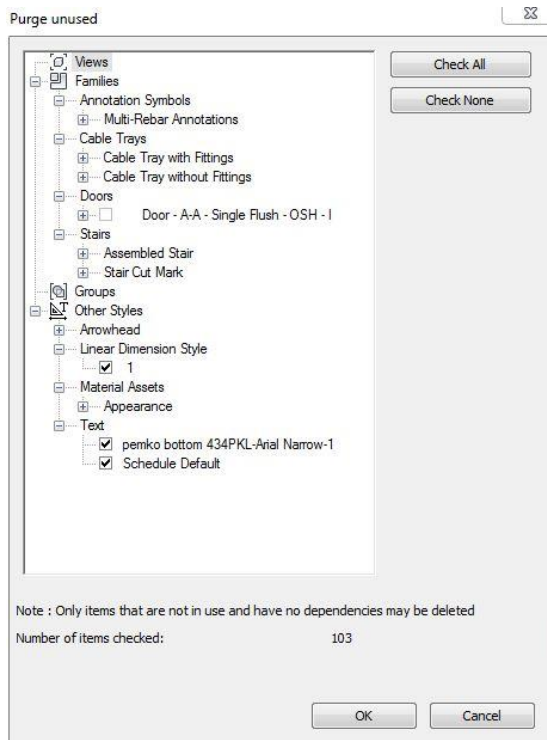
Warnings

Warnings allow users to continue modeling even though something is not quite right. Over time warnings build up and effect model performance. It is best to stay on top of them and clean them out as they occur and not let them build up. Each month and at the end of each phase, teams worked with the BIM Coordinator on cleaning up warnings.
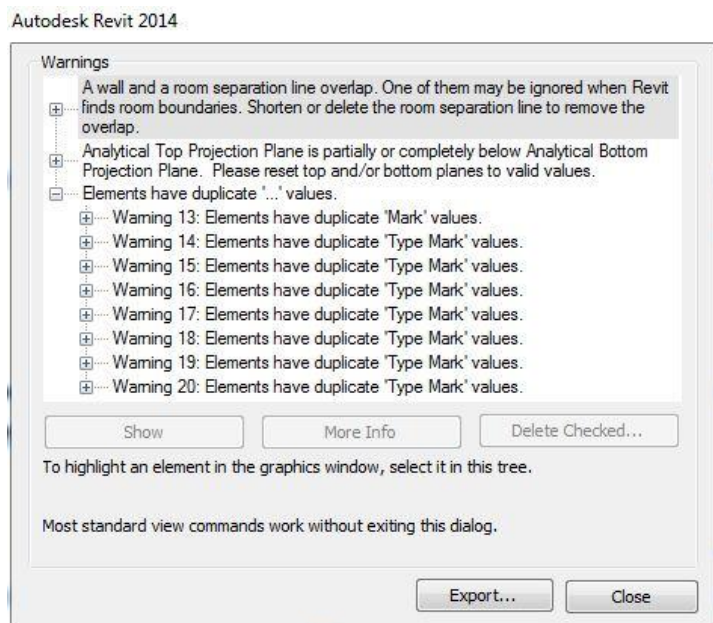
WORKFLOW

One At a Time

Between the two firms, there was a total of 18 people on the project. This at times created a bottleneck during synchronization. In order to keep individuals from synchronizing on top of one another, we instituted a system where you had to have a stress ball in your possession in order to save to central. We couldn't pass it up to Portland, but they used the same system in their office. Therefore only 2 people at any given time could synchronize and this solved the issue. The worksharing monitor was required to be turned on and in view on a secondary screen at all times.

Placeholders

Placeholders were created to get large amounts of work into the model for SD with the knowledge that they would be replaced. We had generic wall & door types. There was also a cube which represented equipment, furniture, or other objects that were to be modeled later. It conveyed the most important aspect of working in BIM – indicating the correct size, shape, and location of an identifiable object. These were much better than detail or model lines. These were replaced with more detailed objects once more information was known. Filters were used to highlight "SD" or "placeholder" objects.
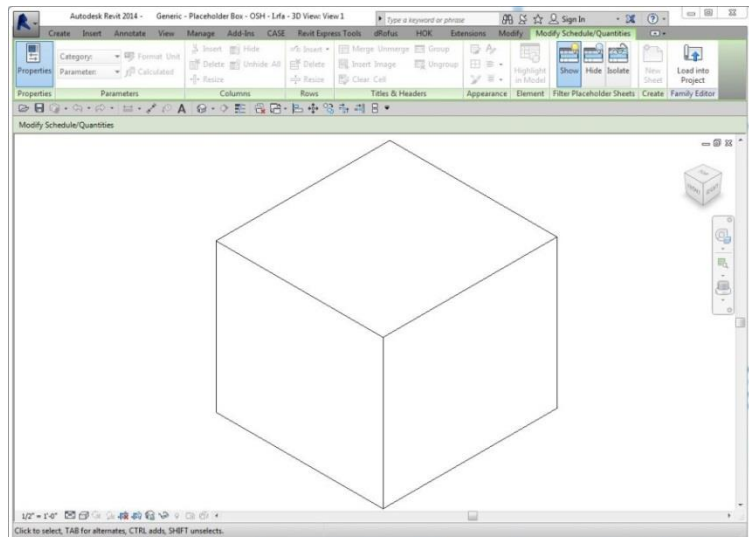
Selective Worksets

In order to minimize load time, users opened the model with ALL worksets closed. Once the model was open, they would select the workset(s) they were working on and opened them. This allowed for faster opening of the model through a Citrix connection as well as saving resources while working in the file.
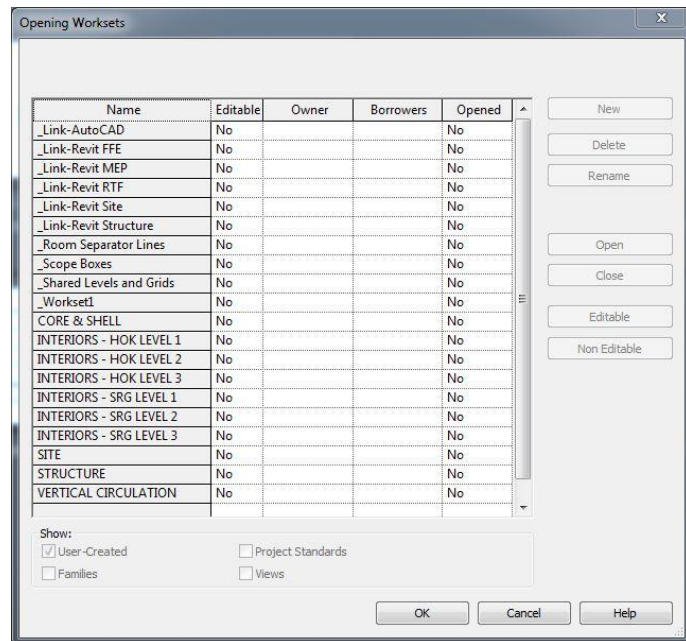
Drafting Details Scrub Model

You can keep a model as neat and organized as you like. It's when you start to import details and families that things start to get real messy. In order to minimize the amount of non-compliant detail lines & components, we cleaned them up BEFORE they got imported into the model. We used an intermediary model which allowed you to review and clean up imported details prior to being inserted into the model.
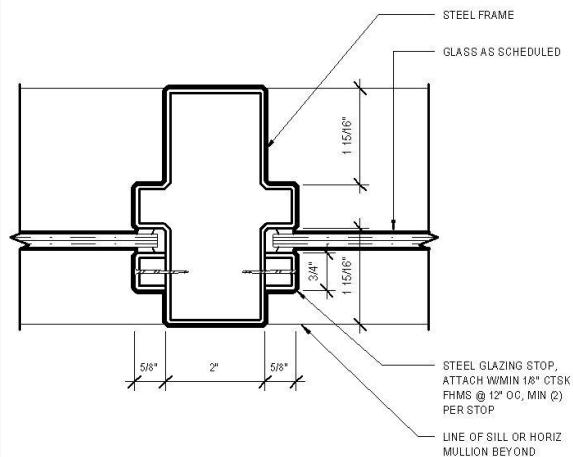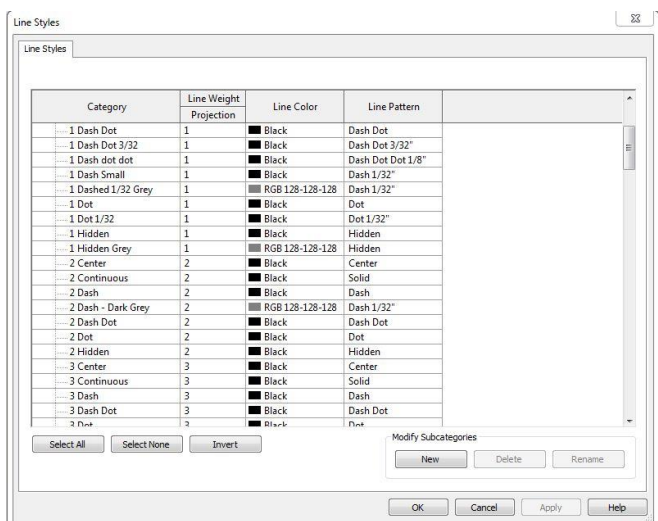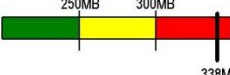
Communication

Synchronize to Central View

The Synchronize with Central view is a drafting view used when saving and opening Revit models. When set as the default opening view, it can act as a message board informing the team about scheduled maintenance file size, major changes to the model, or other critical things that the team needs to know. Since there were many new Revit users, we also used this screen as a teaching tool. It highlighted tips & tricks for concepts that were new to some.


PxP & Best Practices Guide

Project Execution Plan offers a roadmap on how a BIM project will be completed. It defines the flow of information which includes what is being exchanged, when, and by whom. In addition to the PxP, a Best Practices guide was developed to track all decisions that were made in terms of production requirements, annotations, model management, and procedures. This document referred to as The Manifesto was given to all architectural team members as they came on board the project.

Dimensions

The typical dimensions string used is Typical 3/32" Arial Narrow.

Placement
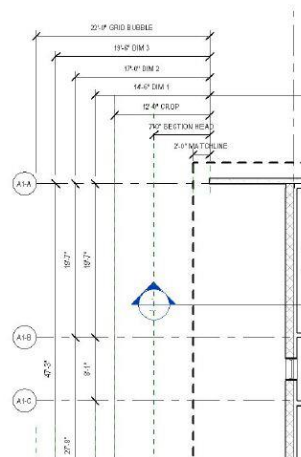
All annotations are placed in a view – never on a sheet. In order to keep model views consistent, we have come up with a system for annotation placement along the outside edge of the drawing.

All annotation should be on the top and left hand side whenever possible. Please use the follow baseline distances for annotation placement working away from the building edge as follows:

- Match line:– 2'
- Center Line of Section Head: 7'
- Crop Boundary: 12'
- Dimension String 1– Segments: 14.5'
- Dimension String 2– Segments: 17'
- Dimension String 3– Full: 19.5'
- Gird Bubble: 22'

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Stand Up Meeting

Workplans are excellent tools in managing the production process. But how do you make sure that everyone on the team is following the plan? On Monday mornings, we would have a quick standup meeting. Each person had two minutes to speak about what they are working on and where they needed help. This ensures that critical tasks are being performed and highlights where resources need to be allocated.
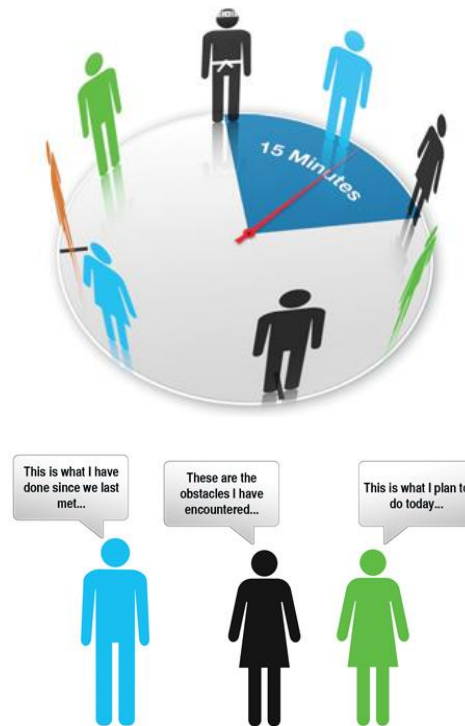
External

With two firms working on the same model, it was important to keep the lines of communication open through phone, email, and instant messenger. SRG had access to the Project's BIM folders and HOK BIM family library through Citrix. Shared work plans were reviewed during bi-weekly coordination meetings that alternated between San Francisco and Portland. Navisworks was used during online BIM coordination meetings held each week with the engineers and contractor.
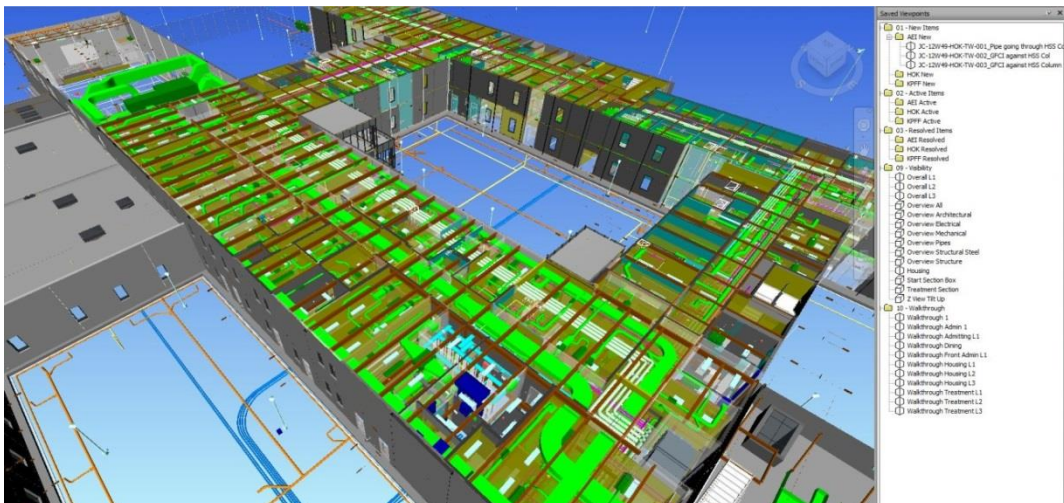
Constant Improvement

- Weekly standup style meeting with both firms together.

- All team members within the same office should be located together.

- Revit capable team members should be greater than 75%.

- Having 6 to 8 people work in a single model is optimum.

- Maximize RAM & user capacity on Citrix server.

- BIM Coordinator to review all families before they go into model.

- Start clash detection earlier than CD.

- MEP should be modeling much sooner than late DD.

- Always model every system to the correct size, shape, position, & material.

- For improved accuracy – SLOW DOWN – this is not an AutoCAD speed test.

- Use models in more than just the BIM Coordination meeting.

- More time needs to be budgeted for production and post-production.

- Always ask – "How can I improve my workflow?"

FINAL THOUGHTS

Keys to Success

The old programming saying that "Garbage in = Garbage out" holds true in BIM. Revit is a very complex program and, only as good as the information put into it. Consistency, communication , and documentation are the keys to successfully organizing and managing that information. This is true for any project particularly a multi-office one. If you stay on top of these you will have a successful project.

BIM Manager Tool Kit