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Matt Snelling
Senior Associate
Landscape Architect
HOK

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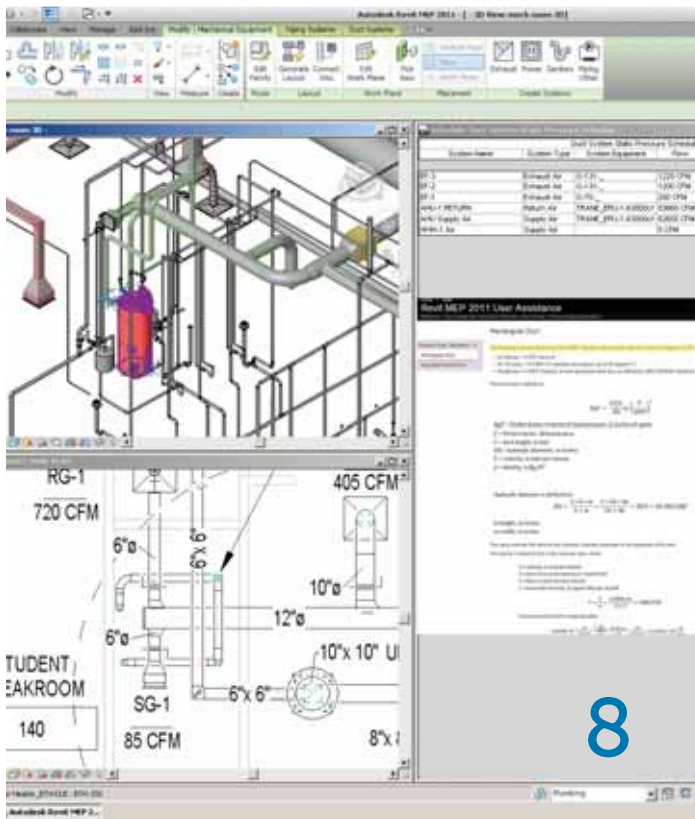
Architecture

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contents

features



6 EDITOR'S MESSAGE

CROSS-DISCIPLINE

8 BIM CALCULATIONS—PROVE YOUR RESULTS

ARCHITECTURE

24 IN REVIT, LITTLE DETAILS COUNT TOO!

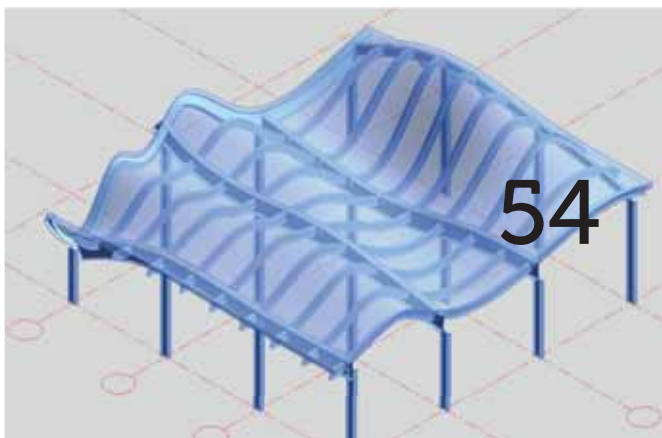
36 SERIES: SURVIVING THE RESIDENTIAL JUNGLE WITH REVIT

STRUCTURE

41 PLACING STRUCTURAL BEAMS THAT SUPPORT COMPLEX ROOF SURFACES

MEP

49 REVIT MEP TEMPLATES





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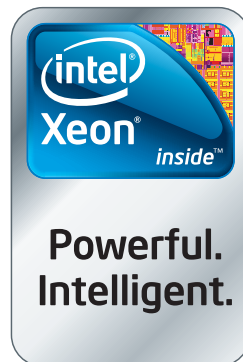


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contents

special sections & departments

DEPARTMENTS

- 12 AUTODESK INSIDERS
15 Questions with Autodesk Construction Technical
Specialist: Jason Dodds
- 15 PRODUCT PREVIEW
"Siteworks for Revit"
- 20 AUGI LOCAL CHAPTER
Los Angeles Revit Users Group
- 39 INSIDE TRACK
AUGI | AEC EDGE brings you recent developments in Autodesk and
AEC related software items.
- 46 HEAD'S UP
HEAD'S UP! Updates, Service Packs and Top Known Issues
(obtained from product pages at Autodesk.com)

46



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AUGI



Welcome to our sixth edition of AUGI | AEC EDGE, we're really grateful that our readers appreciate the work that our authors, editing team and publisher put forth to make this magazine possible. We also appreciate the attention you give to the advertisers and sponsors that support AUGI and this eZine.

WELCOME NEW VOLUNTEERS

We have a two new volunteers helping out with our departments; "Inside Track" and "Head's Up!" Erik Lewis has agreed to take on the "Inside Track" department editor's role. He's a BIM Coordinator by day, writes a blog by night called "Who's Afraid of the Big Bad BIM?". In his spare time he is helping us out too! He didn't hesitate to offer his help when we asked for help a couple of months ago. You can check out his blog here: <http://whosafraidofthebigbadbim.blogspot.com>

Our second volunteer is William Troeak. He has agreed to take on the "Head's UP!" department editor's role. He works for US CAD in Southern California, teaches at Long Beach College and is a blogger too. His blog is called "Revit Journeyman". Like Erik he was quick to respond when we asked for help! You can check out his blog here: <http://revitjourneyman.blogspot.com>

Thanks and welcome to Erik and William! We are looking forward to seeing what they find happening around us to intrigue and keep us informed in each issue going forward.

THANKS AND RECRUITMENT

We always want to thank the authors who contributed their time and expertise to this issue, some new and some returning. Without them this magazine would be empty! They are as follows: Michael Anonuevo, Jason Dodds, Erik Lewis, Aaron Maller, Jay Polding, Marcello Sgambelluri, Daniel Stine, William Troeak, Dave Vaughn, Tom Weir and Jay B. Zallan.

If you really like a particular author's work please let us know so we can apply pressure, friendly, loving pressure, to ensure they return, often! As always if you want to be a part of this magazine as an author or as an advertiser please let us know.

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PLANNING

As always we are actively recruiting for new articles for our next issue.

Thanks for Reading!

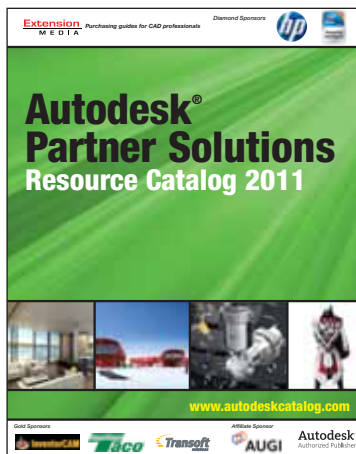
Steve Stafford

AUGI AEC Edge Editor
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BIM Calculations—Prove Your Results

ATTENTION BIM SOFTWARE DEVELOPERS, PLEASE PROGRAM A WAY TO CHECK CALCULATIONS.



It seems like such a simple request. *Can BIM software developers provide a means to list and print all design criteria and computations used to build a design model so that they can easily be checked for accuracy?*

But when discussing this request with other users, via forums and face to face, I have been greeted with everything from blank stares to long winded explanations that quickly wander off the subject matter. It makes me wonder - are we taking software for granted? In other words, we put data in, with the expectation that the software will interpret that data correctly and spit out something that is of more value . . .

My interest lies in the software used by engineers to design structures. Much of this software involves formulas and calculations written with very specific functionality that ultimately makes our work more efficient with a high degree of accuracy. Mainstream BIM packages are maturing into very viable, comprehensive design packages. The datasets and calculations performed inside these programs are mind boggling. A variety of CADD packages, spreadsheets, file management systems and emails are used to communicate ideas and provide the “electronic stamp” that inevitably creates a historic project archive.

At Stanley Consultants, our in-house quality assurance and quality control (QA/QC) processes are closely followed to make sure the client is getting the best and most accurate design we can provide using today’s standards. While this ensures an internally sound product, clients occasionally impose another layer of design complexity into the mix. Some clients require “Design Analysis” be prepared at different stages of the design. The contents are varied in complexity, but when working in BIM software the regular request to provide all calculations is one that can be quite difficult to meet.

Internally we tend to employ two main production workflows – technician driven and engineer driven. Ten years ago we were primarily technician driven with the majority the work done using 2D CAD documentation. Accomplished by an engineer doing calculations and studying requirements, they started sketches and markup for a CAD technician to input on the computer. There are few calculations to perform

or record in the CAD package since the drafting is really a “trace job” of the effort that has already been sketched on paper. These calculations and CADD documents are reproducible and can be tracked for accuracy throughout the QA/QC procedures. These documents can easily be sent to the client for proof of design competency and completeness. Today the production workflow is often engineer driven. Recent graduates tend to be familiar with CAD and BIM and can perform their own drafting and modeling with additional direction.

Likewise, BIM workflow at Stanley Consultants falls into two possible design processes. Either the engineer is skilled in the software package and does all the design personally in the model, or the engineer is not skilled in the BIM package and is forced to again provide sketches and other information to the BIM modeler to begin the process of inputting the intelligent elements into the model.

In all of the above workflows, there are two kinds of errors that have to be investigated, computer and human. Computer error may be caused by faulty coding, using incorrect data tables and the use of values outside the programmer’s intended range of inputs (extrapolation error). Human error occurs when the information is incorrectly entered or the criteria has been interpreted and entered wrong. This list is not all-inclusive but covers the majority of problems that can be identified.

Our standard practice is for a minimum of two people to review each computation.

The first person performs the calculation; the second checks it for errors. Often a third person reviews the final design. A common school of thought is that if the calculations are performed with an approved, certified software program, it’s not necessary to confirm the outputs of the program; it’s only necessary to check what was used as the inputs. Using Trane Company’s energy modeling software, Trace 700, the input data is printed line by line to verify the first person did not make an error entering values in the software. Then if the output seems reasonable, we trust the calculation is correct. If there is any question of the calculations, we can get a printout of every value that was checked. (See Figures 1 thru 3)

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Entered Values

TRACE® 700 version 6.2.6.5
By Stanley Consultants

Project Name: C:\DOCUMENTS AND SETTINGS\8043\DESKTOP\BMPMS OFFICE.TRC		Location: Ames, Iowa	
Dataset Name: C:\DOCUMENTS AND SETTINGS\8043\DESKTOP\BMPMS OFFICE.TRC		Summer Design Dry Bulb: 95.00 °F	
Building Owner:		Summer Design Wet Bulb: 75.00 °F	
Program User:		Winter Design Dry Bulb: -5.00 °F	
Company:		Summer Clearness Number: 0.95	
Comments:		Winter Clearness Number: 0.95	
Cooling Design Period: January thru December		Summer Ground Reflectance: 0.20	
Peak Hour Override: 0		Winter Ground Reflectance: 0.20	
Daylight Savings Period: Summer Period		Carbon Dioxide Level: 400 ppm	
Cooling Methodology: TETD-TAI		Force VAV Min => Normal Ventilation at Design: No	
Heating Methodology: UAAT		Allow Energy Recovery/Transfer at Design: No	
Infiltration Methodology: Vary with wind speed		Reset Design Peaks: Yes	
Outside Film Methodology: Vary with wind speed		Calculate Building Block Loads: No	
Terrain Methodology: Center of a large city			
Room Crc Rate: Medium			
Wall Load To Plenum: YES			
Building Orientation: 0 degrees from north			
Simulation Hours: Reduced year			
Calendar Code: Standard (1978)			
Energy Simulation Period: January thru December			

Internal software certification tests in a range of scenarios that can yield results both reasonable and accurate. This process proves that the outputs are accurate as long as the data has been input correctly. At Stanley Consultants, programs such as MathCAD, STADD, Excel and Trace are certified continually because they are some of our "staple" programs needed for everyday design use.

However, when using BIM software packages it is more difficult to extract the "math" from the model in a format like the example shown above. Thus the train of thought, if we can't check the inputs, we can't trust the outputs. It is my opinion that we may have to start certifying our BIM platforms in the interim to help reduce the burden of proof.

In past BIM projects we have duplicated our calculations using our familiar processes (usually Excel and MathCAD). Typical Structural BIM workflow may include the use of STADD and MathCAD to calculate the stresses and loads.

Figure 1

ENTERED VALUES ROOM BY ROOM									
By Stanley Consultants									
Room Description: Room - 001		Zone Description: No Zone			System Description: System - 001				
GENERAL INFORMATION									
Floor Area: 3,215 ft ²	Fz/Ft Height: 14.0 ft	Zone People		AIRFLOW INFORMATION					
Plenum Height: 4.0 ft	Height Above Pl: 0 ft	People Type: General Office Space	# of People: 5 People	Vent Type: None	Control: None	Plat: None	Plat: None	Plat: None	Plat: None
Base Coat Type: 4 LW Concrete	Room Mass: Time delay based on actual mass	People Schedule: 200 (Bulb)	People Latent: 200 (Bulb)	Vent Value: 100.00 cfm	None	None	None	None	None
Ceiling Type: 780 #17 (Bulb)		People Schedule: Cooling Only (Design)	Workstation: 3.0 workstations	Vent Schedule: Available (100%)	Pressure: Available Const.	Pressure: Available Const.	Pressure: Available Const.	Pressure: Available Const.	Pressure: Available Const.
Is There Carpet? NO	Design Cg (D) (D) Point: 75.0 °F / 75.0 °F			Set Value: 0.30 air changes/hr	Set Value: 0.30 air changes/hr	Set Value: 0.30 air changes/hr	Set Value: 0.30 air changes/hr	Set Value: 0.30 air changes/hr	Set Value: 0.30 air changes/hr
Design Cg (D) (D) Point: 75.0 °F / 75.0 °F	Design Humidity: 50 %			Set Type: Preset/Manual, Average Const.	Set Type: Preset/Manual, Average Const.	Set Type: Preset/Manual, Average Const.	Set Type: Preset/Manual, Average Const.	Set Type: Preset/Manual, Average Const.	Set Type: Preset/Manual, Average Const.
Measure Capabilities: Medium	Design Humidity: 50 %			Set Schedule: Available (100%)	Set Schedule: Available (100%)	Set Schedule: Available (100%)	Set Schedule: Available (100%)	Set Schedule: Available (100%)	Set Schedule: Available (100%)
City Detail: None	Measure Capabilities: Medium			Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available
Hg. Detail: None	Future Type: SUPPLY			Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available
Thermal Location Room: Floor Multiplier: 1	Lighting Type: Fluorescent, hung below ceiling, 100% lead to space			Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available
Humidistat Location Room: Room Multiplier: 1	% Lead to RA: 0 %			Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available
CO2 Sensor Location Room: Room Type Conditioned	Lighting Schedule: Cooling Only (Design)			Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available
	Lighting Schedule: Cooling Only (Design)			Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available
	Ballast Factor: 1.0			Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available	Vav Min: Available

Figure 2

SYSTEM ENTERED VALUES										
By Stanley Consultants										
System - 001 - Terminal Reheat										
Design Air Conditions		Max	Min	Supply duct temperature diff: 0.0 °F						Design humidity ratio diff: Min room relative humidity
Cooling supply	55.0 °F	55.0 °F	55.0 °F	Reheat Temperature diff: 0.0 °F						Min room relative humidity
Learning cooling coil										
Learning supply										
Advanced Options										
Cooling coil sizing method: Block	Supply fan motor location: Supply	Supply fan motor location: Supply	Night purge schedule: Off (0%)							
Cooling coil location: System	Return fan motor location: Onit	Return fan motor location: Onit	Optimum start schedule: Off (0%)							
Block cooling surface: 1,480 cfm	Saving fan configuration: Draw Thru	Saving fan configuration: Draw Thru	Optimum stop schedule: Off (0%)							
Ventilation deck location: Return/Outdoor Deck	Supply fan sizing: Block	Supply fan sizing: Block	CO2-based DCV: None							
Supply duct location: Return Air	Fan mechanical efficiency: 75%	Fan mechanical efficiency: 75%	System ventilation flag: Sum Room OA Reqs							
Return air path: PLENUM	Apply 2582 People Avg: No	Apply 2582 People Avg: No								
Reset per worst case room schedule: Off (0%)	Space air path / duct location: Return Air	Space air path / duct location: Return Air	Space convective gains to occupied layer: 100%							
Use system default outside air reset: Yes	Underfloor plenum height: 0.0 ft	Underfloor plenum height: 0.0 ft	Conductive resistance of raised floor: 0.8 ft-hr ² /ft ² Btu							
	Downstream nominal leakage fraction: 0%	Downstream nominal leakage fraction: 0%	Downstream constant leakage fraction: 0%							
	Aux cooling coil losses to plenum: 0%	Aux cooling coil losses to plenum: 0%								
Controls										
Auxiliary cooling coil: Activate After Primary System	Control Method: None	Control Method: None								
Auxiliary heating coil: Activate After Primary System	Control Type: None	Control Type: None								
Auxiliary fan: No Fan										
Coils										
Capacity	Schedule	Diversity								
Main cooling: 100.0 % of Design Capacity by adjust	Available (100%)	People: 100%								
Aux cooling: Available (100%)	Available (100%)	Light: 100%								
Main heating: 100.0 % of Design Capacity	Available (100%)	Misc loads: 100%								
Aux heating: Available (100%)	Available (100%)									
Preheat: 100.0 % of Design Capacity	Available (100%)									
Reheat: 100.0 % of Design Capacity	Available (100%)									
Humidification: 100.0 % of Design Capacity	Available (100%)									
Fans										
Type	Static Press.	Full Load Energy Rate	Schedule	Efficiency	Demand Limiting	Priority				
Primary: None	0.0 in. wg	0.00000 kW	Available (100%)	90						
Secondary: None	0.0 in. wg	0.00000 kW	Available (100%)	85						
Return: None	0.0 in. wg	0.00000 kW	Available (100%)	85						
System Exhaust: None	0.0 in. wg	0.00000 kW	Available (100%)	85						
Room Exhaust: None	0.0 in. wg	0.00000 kW	Available (100%)	85						
Optional ventilation: None	0.0 in. wg	0.00000 kW	Available (100%)	85						
Auxiliary: None	0.0 in. wg	0.00000 kW	Available (100%)	85						
LEED Fan Power Adjustment: 0.0 in. wg										

Figure 3

Computed by: T Jordan	Comp Date: 10/09/2010	Page No: Project No 22953
Checked by: A. Jordan 10/10/10	Print Date: 10/11/2010	Structural Design
Approved by:	Print Time: 1:29 PM	Sheet 23 of 35

Seismic Detailing Requirements

Special Reinforced Concrete Shear Walls will be used as the lateral force resisting system for this building. The remaining beams and columns are not designated as part of the lateral-force-resisting system and shall meet the requirements of ACI 318, Section 21.13. **ACI 318-08**

The effects of the design displacement δ_u are not explicitly checked, therefore, the requirements of 21.13.4 apply.

21.13.4.1 - The material requirements of 21.1.4.2, 21.1.5.2, 21.1.5.4, and 21.1.5.5 will be satisfied. Mechanical splices and welded splices are not used.

21.13.4.2 - Members with factored gravity axial forces not exceeding $A_g f_c / 10$ shall satisfy 21.5.2.1 and 21.5.4. Stirrups shall be spaced not more than $d/2$ throughout the length of the member.

The most heavily reinforced beam uses 4 - D22 bars (see ROOF BEAM)

$r = 11 \text{ mm D22 bar}$

$A_g = 4 \pi (1.25)^2 = 2.357 \text{ in}^2$, $b_w = 0.45 \text{ m}$, $D = 0.8 \text{ m}$, $d = D - 2r = 723.8 \text{ mm}$, $l_w = 6000 \text{ mm} - 0.45 \text{ m} = 5.55 \text{ m}$

21.5.2.1 - In addition to the minimum reinforcing requirements of ACI 10.5, $\rho_{max} = \frac{A_g}{b d} = 0.005 < 0.025 \text{ OK}$

21.5.4.1 - Compute the design shear force, V_u

$M_{pr} = \frac{1}{0.9} (1.25)^2 \frac{A_g}{1.7 E_c} \left(\frac{1.7 E_c}{1.25 E_c} d - A_g \right) = 348.189 \text{ ft-k}$ probable flexural moment computed using 1.25 f_c and strength reduction factor, $\phi = 1.0$

$W_{DL} = 0.45 \text{ m} \times 0.8 \text{ m} \times 2.911 \text{ k/ft} = 1.07 \text{ k}$ un factored uniform dead load

$w_u = 1.2 W_{DL} = 3.493 \text{ k/ft}$ factored dead

$V_u = \frac{2 M_{pr}}{l_w} + w_u \frac{l_w}{2} = 70.047 \text{ k}$ see Fig R21.5.4

21.5.4.2 - Assume both condition (a) and (b) occur. Provide shear reinforcing over the lengths identified in 21.5.3.1 proportioned assuming $V_u = 0$.

$s_w = 150 \text{ mm}$ works assumed spacing of shear reinforcing, $s_w = 6 \text{ mm } \sqrt{D12} \text{ bar}$

$A_{v, req} = \frac{V_u}{f_y d} = 0.353 \text{ in}^2$, $A_{v, prov} = 2 \pi (1) = 0.351 \text{ in}^2$

$L_{s, req} = 2.1 D = 1600 \text{ mm}$, $d = 362 \text{ mm}$ for 800 deep beams, 268 mm for 600 deep beams

USE: D12 hoops @ 1600 mm for a distance of 1600 starting 50 mm from the face of each support and at splices. Increase stirrup spacing to 600 mm at other locations. (typ. all beams)

$L_{s, prov} = 4325 \text{ for } 800 \text{ mm beams}$
 $L_{s, prov} = 2150 \text{ for } 600 \text{ mm beams}$

Figure 4

Bentley's Plant Design and Autodesk's Revit and Desktop platforms offer mature solutions for today's complicated designs. All BIM software has one thing in common though, an inability to provide an all-inclusive package or shall I say "one size fits all." With Bentley's Structural design, every

nut and bolt could be modeled if that level of modeling was needed. Attributes could be developed for each item to the nth degree, but the stresses and loads were initially designed and calculated from MathCAD, then to RAM or STADD, and then sent out in a mesh to Bentley Structural.

Structurally speaking, criteria are entered beginning with MathCAD, then to STADD for analysis, then into Revit or Bentley Structural. (I understand that ROBOT makes a fine structural software package that can minimize the duplicated work, but I have not had the privilege of speaking with anyone who has used that program.)

Because the software doesn't provide the option of outputting calculations and analysis, it is impossible to prove or check our design within the BIM system. (See Figure 4) Which brings me back to my original question: *Why can't BIM software developers provide a means to list and print all design criteria and computations used to build a design model so that they can easily be checked for accuracy?*

On a recent Revit project, a line-by-line calculation and design check was required by the Corps of Engineers via a

Design Analysis report. An example of a line item calculation in the report may have been duct pressure calculations. (See Figure 5)

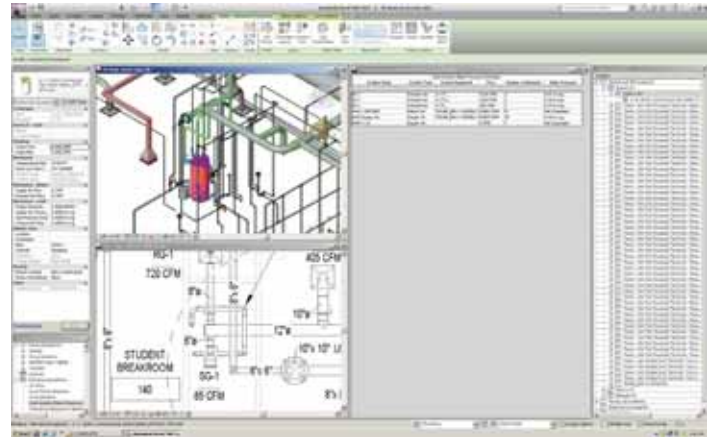


Figure 5

The old school, detailed method for determining the static pressure required for a fan is to generate a spreadsheet with each component of the duct system as a line item. Loss coef-

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ficients were generated by a separate approved program for each fitting and friction loss was calculated for each duct section by the spreadsheet. The summation of the critical duct run represents the highest static pressure required and this value was used.

Using this system, when the checker and reviewer look at the spreadsheet, they can verify every duct dimension, fitting loss coefficient, quantity of fittings and airflows. The most common errors are incorrect airflows, incorrect duct friction factors and the wrong type of fittings (mitered elbows versus rounded, guided elbows).

Using Revit, we can see in the model that the ducts look like the correct size and appear connected, but are all of the branches reporting airflow back to the air handling unit? The system browser and scheduling can get us part of the way there, but sometimes these values are not exportable to a nice clean spreadsheet for easy review. (See Figure 6)

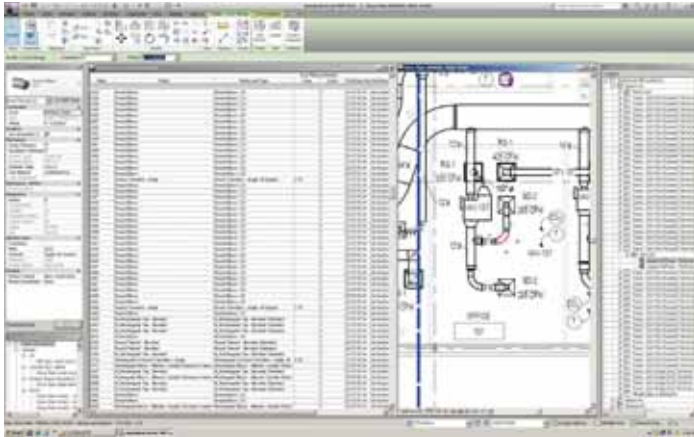


Figure 6

The same is true with duct friction. Duct elbows may look correct, but is the loss coefficient table correct for this size and airflow? There is quite a bit of sifting through instance and type parameters to check some of those values. Another important consideration is not everyone on the design team will be skilled in the BIM package. It is important to provide a way for them to check progress and see the design calculations.

BIM is a good example of "supply and demand." The more we expect from software, the more research and development must go into the program development. From an architect's and engineer's perspective, removing duplication of effort is essential to a smarter and smoother design process. This may also make BIM adoption and integration more attractive and easier to implement.

Check and re-check your work! There are many different ways to accomplish this. Hand calculations and visual checks are the tried and true method. Let's convince the software developers that this functionality is worth their efforts and help us reduce duplication of effort.

Dave Vaughn is a senior architectural technician with Stanley Consultants. Dave has spent nearly 25 years using CAD, 3D and BIM related software packages. He has been using Revit since version 4.0. A strong proponent of the platform, Dave develops company standards and content while providing technical support for projects. Coworker Marcus Matteson, a mechanical engineer also provided input for the article.



AUTODESK QUANTITY TAKEOFF 2011 RELEASED

I know some time has gone by and I have personally been anxiously awaiting its arrival, so I am glad to say that the next release of Autodesk Quantity Takeoff (QTO) 2011 has been released with new updates and features.

Here is a quick look at some of new enhancements (I'll have a few blogs posts in the future to further explore some of the new features):

- Edit a takeoff element or a group of selected takeoff elements from the Properties palette.
- Edit DWF properties from the Properties Box
- Work Break Down Structure Groups. A column for Work Breakdown Structure groups has been added to the Takeoff palette, Property palette, and Workbook.
- Enable takeoff model coloring in 3D views to maintain those colors assigned in the Takeoff palette. This keeps it consistent with the coloring seen in 2D views.
- Legends now accurately depict color, symbols, and fills.

- Exporting to Excel spreadsheets is more accurate.
- Network Deployment of Autodesk Quantity Takeoff installation and licensing is now supported.
- Network license borrowing enabled.
- Model takeoff support for Inventor DWFs.
- Full Windows 7 support.
- Multiple memory and performance enhancements.

A quick note about installing QTO 2011. You will have to remove QTO 2010 prior to installing 2011 since some of the new updates and enhancements will not allow for a side by side installation of QTO 2010 and 2011. QTO 2011 may not install if QTO 2010 is currently installed on the system.

How do you get QTO 2011? For those of your on subscription, you should be able to log into the Subscription Center (<http://subscription.autodesk.com>) and download QTO 2011. Otherwise contact your local reseller for more information.

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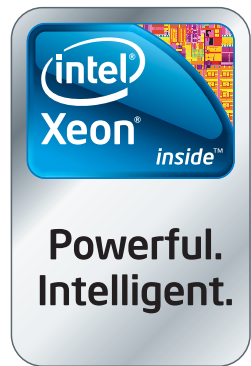


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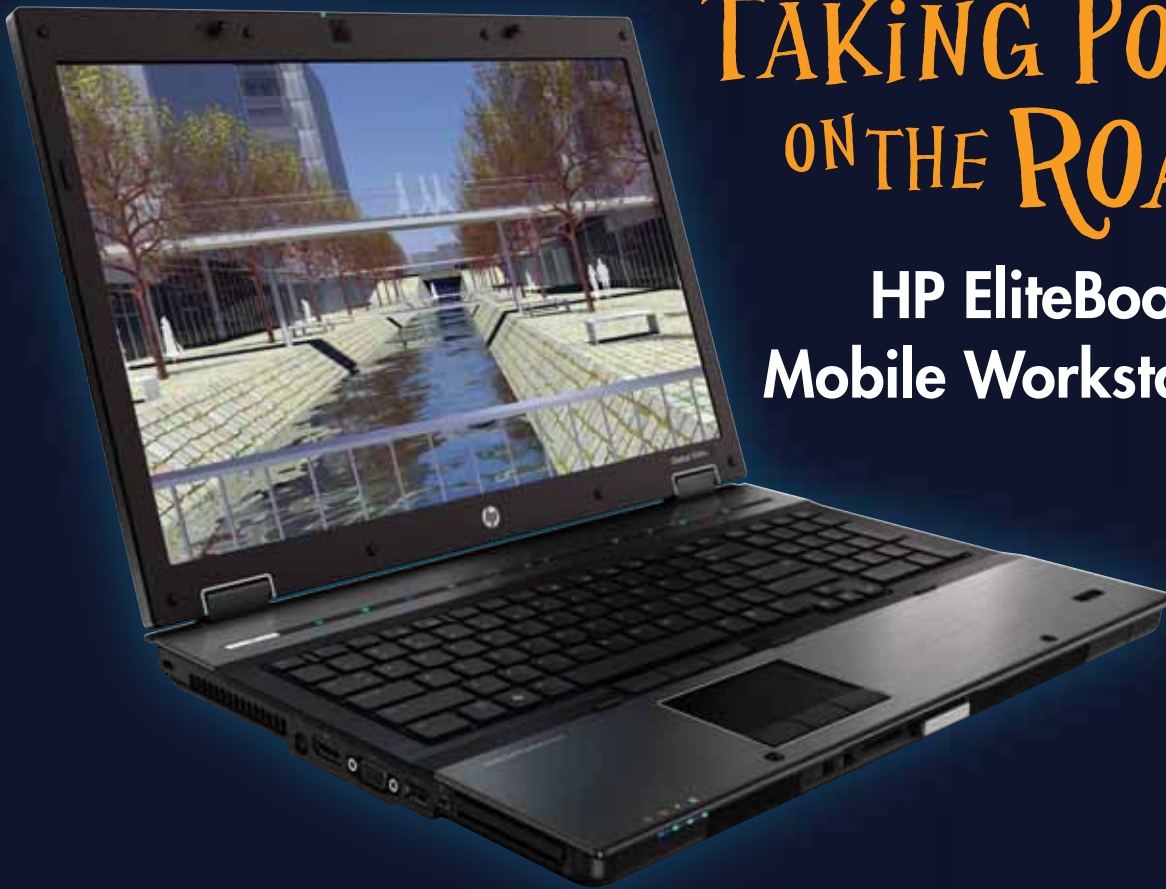
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15 Questions with Autodesk Construction Technical Specialist: Jason Dodds

Your title is Construction Technical Specialist. What exactly is the role of a Construction Technical Specialist Jason?

My job is to support the sales team in a technical capacity and be the in-depth industry expert for construction. I use my in-depth industry and software knowledge to uncover customer business issues, suggest improvements and sometimes get to create business solutions for customers. My goal is to always remain that trusted advisor to Autodesk's customers and give them guidance in this industry.

I accomplish these things through individual customer meetings (from executives to project managers to IT staff and beyond), usually in conjunction with parts of the Autodesk sales team and sometimes our Reseller Channel Partners. I also represent Autodesk at construction-related trade shows and speak at lots of industry events.

HOW LONG HAVE YOU BEEN WITH AUTODESK AND DOING THIS?

I've been with Autodesk a little over two years now, since August of 2008. I sure hit the ground running and had to learn a lot of things from the beginning. I think I really developed a passion for Autodesk Quantity Takeoff right away.

TELL US A LITTLE ABOUT YOUR BACKGROUND AND HOW YOU CAME TO BE DOING WHAT YOU DO NOW?

My 16 years or so in the industry has kept me pretty busy. I have had the chance to work in the construction industry for most of those years doing various things from managing projects to teaching sheet metal workers and pipe fitters how to use Navisworks. I had the opportunity to be involved with the Pentagon Renovation project (attending coordination meetings, teaching others to use Navisworks, managing various projects, etc.) for a while along with some other really interesting projects. I even learned how to use other fun products like TSI CADDUCT and Quickpen's Pipe Designer along the way.

WHAT IS YOUR FAVORITE PART OF THE JOB?

Working at Autodesk in general is just pretty neat. I get to play with all the new software before it comes out, get to meet with some of the most interesting customers on the planet, I'm surrounded by like-minded co-workers, and I get to do a job that really interests me.

HOW MANY MILES A YEAR DO YOU TRAVEL?

Usually well over 100,000. I keep track of my miles and number of hotel stays and such, it's an interesting thing to track. So far this year, I have traveled 101,889 miles to 52 different cities. But I still have around 25,000 miles to go and many more places left to see before my year is up. I guess

autodesk insiders

I spend a great deal of time on the road. I actually like it and start to feel funny when I am home for more than 3 or 4 days at a time. There are times when the travel gets old, of course. Usually it comes to eating out. I get tired of going to restaurants and sometimes crave a BLT made on my own stove or maybe something out on the grill. But the flights and hotels never really bother me. I guess I have grown accustomed to them.

I have plenty of funny stories about being on the road and forgetting which room is mine and having to go back to the front desk and ask what room I'm in. I have had to walk through the parking lot a few times to try and find my rental car a few times because they all start to look the same.

WHAT AUTODESK PRODUCTS DO YOU FOCUS ON?

My products are created mainly for the construction industry. I know a lot about Autodesk Quantity Takeoff and Navisworks. I was a Navisworks user prior to coming to Autodesk, so that really helped. I also spend time talking about Buzzsaw and Constructware. Of course I cannot forget about all three flavors of Revit (Architecture, MEP, Structure) and how they fit in the construction process.

WITH THE ADVANCEMENT OF BIM TECHNOLOGY AND THE ABILITY TO DO TAKEOFFS FROM THE DATA IN THE MODEL, DO YOU THINK TECHNOLOGY IS EDGING OUT THE ROLE OF ESTIMATORS?

This question comes up all the time and I have to answer it as "no". I don't think technology is edging out the estimators at all. I think in fact it does the opposite and give estimators the chance to spend less time quantifying projects and more time actually estimating.

WHEN YOU ARE SPEAKING TO CONSTRUCTION COMPANIES, WHAT MESSAGE DO YOU WANT TO CONVEY?

Plan, plan, plan and plan even more prior to getting started with BIM. I often run into many of customers that complain about the struggles they have had with modeling, or coordination or the list goes on and on. It's usually for the same reason that they jumped in with both feet and only had a small pseudo-plan, or none at all. Then they tried to execute and got a little burned. It's like the saying goes, "He who fails to plan, plans to fail". So my advice would be to create a good solid plan, make sure you have the right team in place and then execute on that plan. Don't be afraid to ask for help either. That's where Autodesk authorized resellers and people like myself can help the most.

WHAT DO ARCHITECTS AND ENGINEERS NEED TO KNOW ABOUT WORKING WITH CONSTRUCTION COMPANIES AND ESTIMATORS?

Don't be afraid to communicate with contractors and be willing to share models. In my travels I have found that most contractors are actually very much interested in protecting

the "design" created by the architect or engineer. When a contractor requests a model it's not so they can corrupt the design; it's usually for several other practical reasons to make the project more efficient or to improve coordination and construction. My suggestion to designers and engineers is to talk with contractors who are already using BIM and ask what they need the model for, how they plan to use it, and then agree on plans for moving forward.

I think I would offer a second piece of advice as well, and that's talk to contractors about how they want things modeled, and what naming systems they plan to use. Those little conversations can go a long way to delivering something beyond design intent and closer to constructability.

WHAT TECHNOLOGY "GADGET" HAVE YOU FOUND YOU CAN'T LIVE WITHOUT AND WHY?

My Apple iPad for sure; I don't go anywhere without it now. It has come in very handy for being able to get through emails while at dinner or sitting at the airport, giving PowerPoint presentations, looking stuff up on the internet, or even reading a book. My iPad always surprises me with some of the new innovations that come along with games and apps. I have even started to find ways to squeeze more work in with the iPad... Shhh, don't tell anyone.

WHAT IS ONE OF THE MORE COMICAL THINGS THAT HAS HAPPENED TO YOU ON THE ROAD?

There are so many to choose from, but I think it has to be when the people mover at Chicago O'Hare Airport tried to eat my Birkenstock shoe. As I was stepping off the people mover, the back of my shoe got caught and I went tumbling face-first into the ground while my shoe was flung a few feet away. Most people just stepped over me, but one gentleman was nice enough to hand me my shoe, laughing the whole time. Needless to say, I sat there and laughed at myself for a few minutes before putting my damaged shoe back on and carried on my merry way back towards my flight.

HOW DO YOU UNWIND FROM YOUR DAYS AT WORK?

While on the road it could be as simple as just having the chance to watch a little TV. Other times it's finding out that there is a good microbrewery in town that I can visit. Either way the real trick for me is to find an hour or so that is just mine to do something other than work. There are days where it does not matter what I do so long as I have the chance to disconnect from the world and collect my thoughts from the day. Then wake up and start again.

Now of course when the weekend gets here, it's time to get in the Jeep and go climb some rocks, play a round of golf, snowboard in the winter, or maybe find something to toss on the grill. But it all goes back to disconnecting from work for a little while.

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Mehrdad Yazdani, Principal of the Yazdani Studio of Cannon Design



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"HP Workstations have proven themselves over and over again to be the best tools for our needs."

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When Senior Designer, Philip Ra's team first began working with HP Workstations, they saw immediate benefits. "In the past, it would take hours to render something with a high level of detail; now it's almost instantaneous," he notes. The decision-making process is faster than ever before. "Now we can revise our work and show clients the changes they've requested almost immediately to get a sign-off on the project," he says.

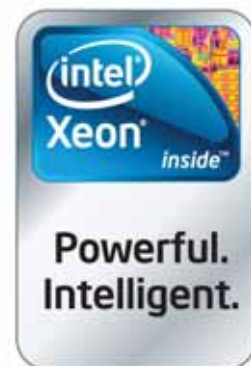
Ra compares computers to cars. "They all will take you from point A to point B. But if you want to get there faster, if you want to be certain about the outcome, you opt for a brand that is known for reliability and performance. That's why we use HP Workstations. They have exceeded my expectations again and again."



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Figure 1- A day out in the jeep

WHAT TIP WOULD YOU GIVE TO OTHERS THAT TRAVEL?

I think two things that have really helped me are to sign up for the rewards programs that the airlines and hotels offer. It may take a while to build any sort of status, but it goes a long way in the end towards getting upgrades and free stuff. Plus the stored rewards points are really nice for future vacations and things like that.

My second piece of advice would be patience. Airports and airlines screw up all the time. It's never going to help getting mad at the person on the other end of the counter or annoyed with the long line. Be a little patient and understanding with the long lines or delays. I have found that it goes a long way to getting what you want in the end. Now that I have learned the patience lesson at the airports, my stress level has gone way down and the travel does not get under my skin like it used to.

WHAT ADDITIONAL PROJECTS DO YOU IN HAVE THE WORKS?

There are really two that keep me occupied most of the time. I have my construction focused blog that I try to write on as often as I get the chance <http://blogs.autodesk.com/doddsandends>. I have also started working as an Autodesk personality to support the construction industry. "Ask Jason" was created to support the construction industry as a technical resource so that people have a place to ask about their construction-related issues. You can visit "Ask Jason" at www.autodesk.com/askjason

So far both are going well and keep me pretty busy, but they're an adventure for sure. I have other things I am working on, but I'm not ready to reveal what they are right now. More and exciting things to come on those projects soon!

WHAT IS THE BEST THING YOU HAVE LEARNED SINCE WORKING FOR AUTODESK?

I have learned a great deal about myself, especially how I communicate with other people. Autodesk is very much a people-focused organization, and I have discovered a great many things about how to work effectively others and how to improve on myself. I think I have grown both personally and professionally and will continue to grow thanks to the people around me and the new technologies and ideals that I am exposed to.



Figure 2- All dressed up...

Jason Dodds is an Autodesk Construction Technical Specialist, located in the Denver, CO, area. Jason has been actively involved in the design and building technology community for over 15 years. During his career, Jason's focus and experience has been with construction, architecture, interiors, structures, MEP, construction administration, and technology for companies such as Michael Baker Corporation and Southland Industries. He has been involved in all facets of design and building processes and understands what it takes to complete projects from design, estimating, coordination, to fabrication. In his role at Autodesk, Jason plays an integral role in advocating and implementing the company's Construction and BIM solutions throughout North America.

Siteworks for Revit



WHAT IS IT?

Siteworks is an add-in for Autodesk Revit built by Eagle Point (www.eaglepoint.com), to supplement the Site Modeling tools in Revit. The intent is to allow Architects working in Revit to create a more robust model of their Site Design Intent, to pass to the Civil Engineers and/or Landscape Architects downstream in the process. LandXML files of the Existing terrain are importable, and using the Siteworks tools to place Roads, Sidewalks, Parking Lots, Curbs, and Soft Terrain features re-grades the terrain (and creates the feature elements), which can then be exported to LandXML again.

QUICK OVERVIEW

Having had a month to play with Siteworks in experimentation, a few things are worth saying: Creating decent site models in Revit has been a sore spot for designers for as long as I've been involved with Revit. On a relatively flat site, there are workarounds aplenty: Floors, in-place geometry, line-based families, sub-regions and tedious point editing of native Revit topography. This add-in does model features like Roads (replete with gutters and curbs), berms, and some amount of terra-form and does so with ridiculous ease comparatively. On a sloping site, or a site with a myriad of plateaus, depressions, hills and juts it simply does the math and generates a 3D model for these elements in an amount of time that just wouldn't be feasible with the amount of math required to manually re-grade the site. It isn't completely without a cost: The add-in (like Revit itself) is in its infancy, lacking refinement and capability in some areas, while excelling in others. Let's go through each aspect:

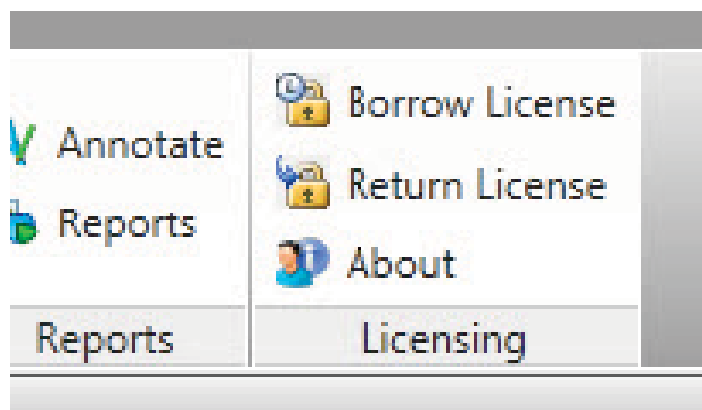


Figure 1 - The Siteworks ribbon panel

INSTALLATION AND REQUIREMENTS

Siteworks requires Revit 2011 with Web Update 2 (all three verticals). Installation is straightforward, allowing for network

location of all Siteworks library files, for offices with more than one user. They have two license options: Standalone and network. The network license allows for the installation on many machines and has a "Borrow license" button on the UI (see Figure 1). Items created in Siteworks appear perfectly without the license but the Siteworks tools will not edit them without a license. I did not test the network license but I did test the lack of a present license.

CREATING SITE OBJECTS

To create a road, or berm, or other site object, a toposurface must be present. What took awhile to figure out is that Siteworks will actually make a COPY of that Toposurface. This gets a little tricky, with worksharing, so read on. Documentation and Help files have been released since my test of the software but I haven't had a chance to view them. So these items are noted as I've stumbled into them, which can be confusing if you don't know to expect it.

Once your topo is in place you can either: Draw lines on the fly to define your site object or have them drawn ahead of time, it's your choice. They can be detail lines or model lines, Siteworks doesn't care. Here's the catch: Those lines then "belong" to the Siteworks object. They should not be modified by users, without using the Siteworks toolset, or the Site elements may not respond in a predictable fashion later on. Siteworks is going to hide the lines "in every view" so they're not accessible (except with Reveal Hidden Elements on). I've tested this a decent amount, and Siteworks places them on Lines: Lines, which is hidden. It also seems to hide them at the Hide Element level even in new views. They can be manually unhidden, which isn't advisable as it can cause problems with the Siteworks objects.

SUGGESTED WORKFLOW

Build your entire site in a separate model. I debated "site linetypes," Model lines, Detail Lines, whatever. Then I realized: Siteworks converts them to "Lines: Lines." So managing this with multiple users in Workshared projects could get out of control fast. Especially when you consider our friends "select all instances" and "window selection."

Supposing you have the lines drawn (centerline of site object), making them is a breeze (see Figure 2). (To reiterate, this is the part with serious value.) You click the type of object you want to create (Locate) and you click the lines. A couple of dialogue boxes pop up (asking what phase to use, and which topo to base it on, in case there are multiple. (This gets hairy on complex sites since some Siteworks objects (parking lots) are topo's themselves). There is a dialogue box for the "object" as well, where it asks you to "Specify a Road Family." These are kept in a library that you

can customize with variations on sizes. It would appear you could also have entirely different variants of geometrical composition (since these “appear” to be parametric profiles of some sort), but it’s not that easy.

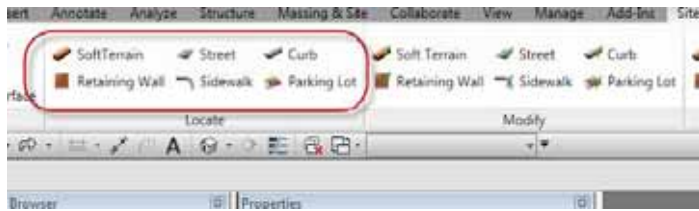


Figure 2 - Siteworks Locate panel and tools

For Elevation you can choose between:

- Absolute Elevation
- Elevation Relative to Toposurface

Once you’ve done that and click the lines, Siteworks takes a few seconds to create your Road (or other objects). It also re-grades the topography so that it sits neatly underneath the objects it’s created (see Figure 3). What it is generating (for all things non-terra), are Mass Component Families (not in-place).

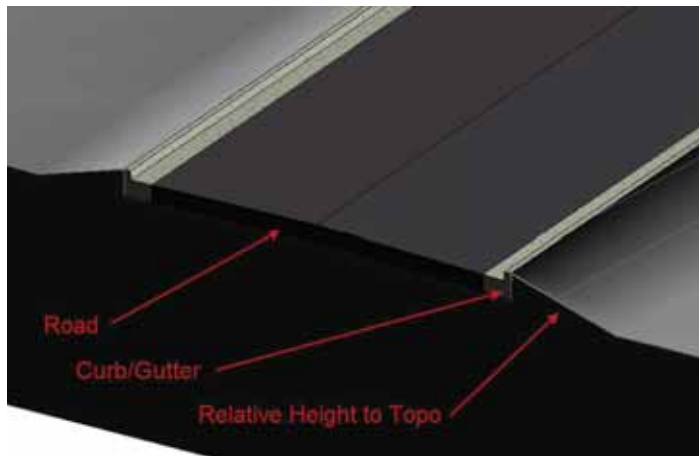


Figure 3 - A screen capture of a road profile

HERE IS WHERE THINGS GET INTERESTING

It knows well enough to make them out of separate components, for the Gutters/Curbs, Roads, sidewalks, etc. I had an interesting occurrence the first time I tried this, and it yielded an interesting conversation with Eagle Point, as well: At first, Siteworks couldn’t find my Mass.rft file (not in the OOTB location). There are Sample Families for each type of object (which have no geometry, only parameters), and there is your Mass.rft, which is used to generate the geometry. So everyone upset about it really making “masses” take note: There is a Siteworks.ini file that will let you specify the Mass template to use, for EACH type of Siteworks object, and it works like a charm. It’s that easy. A template for Roads, a Template for Gutters/Curbs, a Template for Sidewalks, all with a different text value for a Shared Parameter “Site Category.” Separating your features really is that easy. Having tested this out- even being the staunch category purist that I am- I now

considers the components being Masses completely a non-issue. NOTE: The Siteworks.ini file won’t contain the lines with the paths for the various objects until after you’ve tried to make each object type once. So either: Copy the code from someone else, or set up Siteworks, try to make a road, a sidewalk, and a curb, and then go edit the Siteworks.ini file.

The objects you create will Schedule, and will report Volume as long as Revit likes your “Masses.” I observed that if it decides something is “off-axis” it will- on a rare occasion- not calculate volumes for you. Interesting tidbit: Revit “Mass Schedules” will report more than double the areas, since Revit schedules total Surface area (think six sided cube). Siteworks Reports however have their own calculation method for true plan area, and report correctly! Added bonus. That is, however, a tab or comma delimited text export report. Hopefully soon Siteworks will turn that in to a native Revit schedule even if using Shared Parameters and text entries.

You’ll need to remember they are families and the Edit Family button stands loud and proud in the ribbon. Eagle Point recommends users “should not manually adjust the families or adjust the lines used to create them,” as things may not behave as expected. In my testing this is very valid. Using Edit Family takes you to the Conceptual Massing Family Editor, and sure enough, your curbs and roads are there. I dismantled part of a road family and loaded it back in. When I told Siteworks to Edit the Road, it made changes to the shape of the road, but it would not “heal” the part of the road I broke.

To “Edit a Siteworks” object the Lines: Lines (category and subcategory) must be visible in the current view. As mentioned before, Siteworks will hide the lines in all views, and will unhide them when you click Edit. It won’t know to unhide the subcategory if you’ve hidden it with a View Template a Filter, or by Category.

It is extremely intelligent about what it lets you do when you Edit a Siteworks object, such as raise a vertex, redraw the path or change the elevations of objects. Plus, just as it had edited the topo to run underneath the site feature, it goes back through and revises the toposurface so they’re continuously under the revised Site Object you’ve created.

WHAT IT CAN AND CAN’T MAKE

It will create the following using the mass category: Roads, Sidewalks, Curbs/Gutters), Retaining Walls. It uses the Topography category to create Parking Lots and Berms. At this time it can’t create Corridor Intersections, like Civil 3D does for example. It will run the two roads over each other. However you can use the Curb toolset to draw the 4 “city-blocks” as islands and then use the road tool to draw a curb-less, gutter-less “road”. That will get you about 90% of the way there. The fillets at the corners of the curbs will have no “road” under them. You’ll have to be creative. But considering the time you saved versus hand modeling the roads, maybe that’s not the end of the world?

It doesn't appear to do transitions from two lanes to three lanes. It uses Family Definitions, with preset constraints for width of different portions of the road. I'll go out on a limb with my own thoughts and say I think this is one family creation away from happening. But it might be that they have to make the family and integrate the functionality. Knowing as much as I know about how Siteworks does things now I can't see a reason why this wouldn't be possible. I have to believe Intersections are in that realm as well. The folks at Eagle Point tell me both features (Corridor Intersections and Corridor Transitions) are in progress for the next twelve months which made me raise an eyebrow: I consider the math behind Intersections one of the things that is so fascinatingly complex about Civil3D. I'm enthralled if it's coming to Siteworks as they say. Time will tell.

It doesn't cant or bank roads in section, although I hear it's on the wish list for next year.

Retaining walls don't use System Walls but I don't see this as a huge detriment. Anyone bothered by it can use Wall By Face on the Retaining wall Siteworks built and get Related Host Wall updating from the Siteworks tool.

LANDXML INTEGRATION

Siteworks comes with a Panel for integrating with landXML (see Figure 4). Regrettably, at the time of the article, I hadn't gotten either to work. But I do believe they do. I tried an Export LandXML however and the file that came out at the end was extension-less, very much not an XML. My assumption for the import is that it will bring in a toposurface, but I believe the plague of Object Proxy will still prohibit any advanced modeling from Civil 3D to come over. I can't say for sure. I've received commentary back on this subject and some features of the C3D model should come over. But though I've received more time for testing, I couldn't get a LandXML file from my Civil colleague fast enough to test before print time. I'll give them benefit of the doubt.

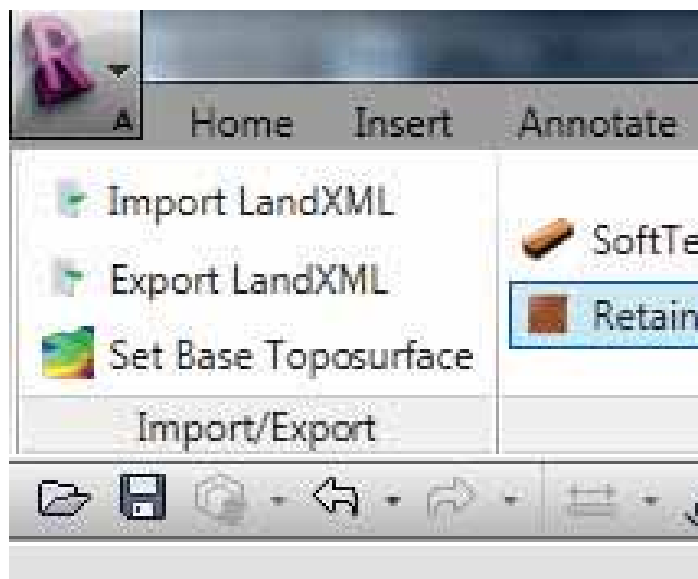


Figure 4 - Sitework's LandXML integration panel

REPORTS

Siteworks comes with a panel for Reporting. At minimum it is a connection to Revit's Topography Reports as they already exist. An added bonus you get really decent Cut and Fill estimates because of the way that Siteworks alters the toposurface (see Figure 5) when it puts in the Site objects. As for scheduling the rest of the components, if you've started out with different family templates, as I mentioned earlier it works like a dream. I banged out a Site Model and scheduled my Roads, my Curbs, all separately. They are all Mass schedules, but completely segregate-able. I consider it a non-issue, even if the customizing I mentioned earlier doesn't work. With the advent of Filters I personally use Revit Categories for less and less these days. Eagle Point didn't have a choice really. If we can't make categories, they can't make them either. They rely heavily on the Conceptual Massing Environments new capabilities which aren't available in any other Family environment. If we don't want our sites modeled as masses we must make ourselves heard at the Factory. We need them to agree that category manipulation is important to us and that having conceptual massing tools in the rest of family categories is important too. To be clear, this is nothing Eagle Point can do much about since it all resides with Autodesk.

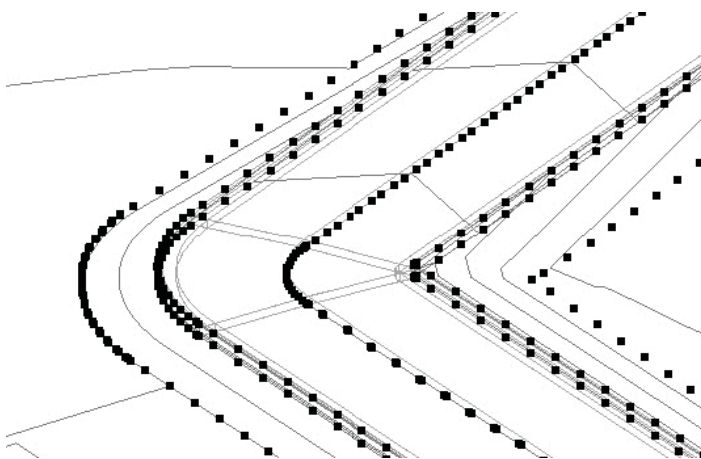


Figure 5

In addition, there is an Annotate feature. This one is wild: It will note Grades and Elevations for the Siteworks objects (complex roads, etc). How does it note them? Well, it places text on top of them. I can't find a fault in the methodology, honestly. A vendor cant build a tag, for an object type that doesn't exist. Perhaps they could have used the Spot Elevation tool, but I'm not sure it's any more automatic. These text tags do update if the item is changed. But word to the wise: They are text notes so uses can go and type in them. Maybe one day they will tie in to the native Spot Elevations and Slope Annotation but there's a bunch of complexities there. For now... I have no complaints.

PLAYING WELL WITH OTHERS

During my testing, there were a few times Siteworks was trying to accomplish something, and it couldn't (for a variety of reasons). It simply displayed a message such as, paraphrasing "The External Command could not complete, you will be taken back to the

point prior to editing.” This made me curious about how it would behave with Worksharing, and with Design Options. Here is how it went:

Worksharing: It behaved very much as I expected (that’s a good thing). Since Siteworks re-grades the Topo has you change the site features, if the topo isn’t editable, or is borrowed by someone else, it gives you the “element borrowed” screen, and tells you the Object isn’t initiated. So it works as expected, in that regard. One trick thing: As I mentioned earlier, Siteworks makes a copy of the toposurface. Now, it seems well versed at keeping both of them updated, but it’s tricky with worksharing. It will let a second user edit the second topo while the Siteworks user edits the topo with the features in it. I’m not really sure how that works, but it does. Now, my knee jerk reaction was I’m not sure why it created a duplicate to begin with, so I’ll delete it. That’s a no-go. A host of features (Annotate comes to mind) stop working if you delete the second. All the more reason to put the Site in its own model, as mentioned under Suggested Workflow.

Design Options: This one is tough. Siteworks works fine, with design options... As long as you consider how Revit handles Design Options. What I mean is that Family definitions can’t be part of design options. A family is defined at the project level. Here is where the process breaks down as all of the objects in Siteworks (that aren’t topos) are families with individual definitions. So if you want to make a design option for “Road 1,” there is a technical issue: Road 1 has to get defined at the Project Level. Siteworks functions correctly with re-grading the topo in each option, where “the road” needs to go, but the Roads/Curbs/Sidewalks can’t be part of the Design Options since they’re Family definitions. Again, to be fair, I don’t find this to be a shortcoming of Siteworks. Until the “objects” they’ve created become System Objects (Factory?) this level of integration won’t happen in Revit. My suggestion? (It’s the ONLY time you will hear me say this, as I wholeheartedly believe in the Design Option tool) if your Site is a separate model do a Save-As for your Site options. The tool works wonderfully, this is just the nature of the beast unless Family Definitions can get moved to the Design Option level.

USER INTERFACE ISSUES

Anyone who has used Civil 3D can testify that Dirt-pushing software seems destined to be dialogue box heavy. Siteworks is no exception and it has some oddities you should prepare for before embarking. There are a number of pop-up dialogue boxes. Strangely some of them know to query your computer setup for which monitor Revit is using (monitor 2 for example) and some of them do not. They default to the upper left corner of the Primary monitor in all circumstances. That shouldn’t be a huge issue but I did have problems moving from the office (with 2 monitors) to moving home (laptop monitor only). The dialogues that were always at the upper left corner of the primary monitor wouldn’t come back while at home unless I moved Revit to that monitor prior to leaving the office. I’ve had this issue with a few add-ons before. Just beware.

CANCEL=ACCEPT

The commands to make (Locate) Site Objects or Modify Site Objects ask you to select or draw chains of lines in a Siteworks Sketch Mode. As it’s not part of native Revit there is no Context Ribbon for “Finish Sketch/Cancel Sketch” buttons, there is only the Right Click Menu. From the sketch mode you must use Right Click > Cancel. That combination finishes the command by taking you back to the dialogue box for the object creation. That takes some getting used to and it may be confusing when training the masses. Now you’ll have to remember that cancel means cancel (in Revit), unless you’re using Siteworks, then it means finish. (I hear this will change soon, so just beware in the interim).

Training on the whole is a small concern of mine, not because it’s difficult to use, but because it’s different. Create <object> and Edit <object> are completely different buttons. Selecting an object doesn’t bring up a context edit (besides Edit Family). Lines can’t be touched and view range issues tell you things don’t exist or aren’t valid when they are. This irks me as it is fundamentally working against what Revit is about. The object exists whether I see it all or not! Delete is a very dangerous key (keyboard delete, not Siteworks Delete) because Delete doesn’t heal topography. So you must remember “If its created in Siteworks, we have to delete it through Siteworks.) By comparison if we delete a Curtain Wall the wall it’s embedded in heals assuming embedding is enabled. Again, it’s not difficult to use, it’s just different.

OVERALL IMPRESSION

At times it might sound like I’m being hard on Siteworks. I have high expectations and I always want more. I have a lot of praise for the tool. It is fantastic that, for those of us that want to stay in Revit for our Modeling and Visualization, the sheer capabilities of what it can model, versus the amount of time it would take to do it manually, make it practically a no-brainer. Even if you’re used to porting to 3DSMax for your Visualization work and you want a site at all in your documentation that workflow isn’t helping your case.

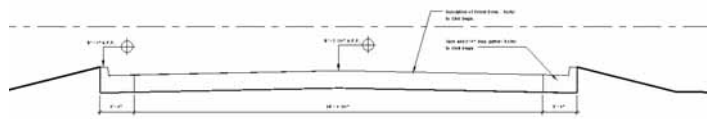


Figure 6 - Road cross section

Siteworks will! At \$2,400 dollars per license it’s a steep price when compared with the cost of Revit itself. However, divided up amongst the number of hours it would take to flesh out a decent site model in Revit (without Siteworks) for contextual relevance, I think it pays for itself pretty quickly. Consider that you might only need one network license since you can install it on all the machines and let people take turns with it. I am personally advocating that my Firm acquire it immediately.

Is it worth it in my opinion? Yes, and it’s not even a wavering yes. And that’s coming from someone staunchly against add-ons. However don’t purchase this expecting to bang out a full tilt site

model on the first day. There's a decent learning curve while you get used to it and what it wants from you, versus what you think you should give it. (Sound familiar?)

If you're looking to do true civil or site design/engineering with Siteworks, Eagle Point has been clear by stating "It's not meant to be a full civil package, it's for architectural representation only." They may say that but (strictly my personal opinion) what I see is clearly an infant version of what could be a civil package with a grand amount of fine tuning. Corridor intersections, banks, bridges, utilities, drainage and runoff calculations are all things it would need to be a full-fledged civil application. This review is based on having tested it with Revit Architecture. It could be argued that this package atop Revit MEP (assuming the site tools were enabled), with a few well built pieces of content to cover some shortcomings, could be a much less intimidating and just as capable option as Civil 3D.

Aaron Maller is the Building Information Modeling Manager at The Beck Group, in Dallas Texas. His role is to oversee Revit implementation, content standardization and deployment, BIM execution strategies, as well as providing staff development and training in using Revit for various roles: Architectural design, documentation, detailing, estimating, and construction coordinating and prefabrication. Aaron provides day to



day user support for the Architecture, Estimating, and Construction groups in the various Beck offices, and develops and maintains the office content across the offices. Aaron joined the Beck Group in Dallas after moving from Upstate New York, where he graduated from the School of Architecture at the State University of New York at Buffalo through 2005. He then began working in Architectural design and documentation, investigating workflows in AutoCAD/ACA, Digital Project, Vectorworks, and ArchiCAD, prior to his work in Revit. Since then he has worked on Architectural projects ranging from detailed Interior Millwork retrofits to large scale multi-phase renovation and new construction projects in Revit. He is currently studying for his ARE's in Texas. He can be reached at aaronmaller@beckgroup.com.

The Beck Group's model of Integrated Enterprise- with Architecture, Estimating and Construction merged together- works to eliminate the gap between design and construction by maximizing efficiencies in workflow, knowledge sharing in a team-centric environment, and innovating creative solutions through advancing technology and investing in strong cross-training, working towards excellence at project-oriented objectives, through process improvement strategies. Find at more at www.beckgroup.com

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AUGI Local Chapters: Los Angeles Revit Users Group



As the main facilitators of the Los Angeles Revit Users Group it has been a great privilege over the last few years for us, Tom Weir and Jay Zallan, to have the opportunity to be associated with this dynamic group of like minded professionals in Southern California. In such an exciting time in the evolution of the AEC industry, with such an amazing software program as Revit, we are grateful to groups like AUGI for their continuous support. The following is a brief history of the Los Angeles Revit Users Group. Jay and I hope that this might spur others on to begin their own group. Organizing meetings can be a lot of work but the rewards that we gain always seem to make the effort worthwhile. Tom started it all back in 2003. Here is how he remembers it.

Soon after Autodesk bought and published Revit as its own in 2003 I was invited to a sales presentation to see the new 3D program. I had spent much of the previous year and a half transitioning from 2D Autocad to the new Architectural Desktop product. It was a daunting task. Trying to make a 3D program out of Autocad just did not seem to be working. It was like they were trying to make a 2011

Chevy Volt out of a 1932 Deuce Coupe; just not going to happen. So it was with great interest to me when Autodesk announced that they had bought Revit. They now had two competing products in their lineup. What sense did that make? When I asked that question they said that if I had already made a big investment in Architectural Desktop I still might want to buy a seat of Revit to try it out. So I went back to my office and downloaded Revit 5.1. I started doing tutorials and within eight weeks went into production on our first Revit project at Brandow & Johnston and never turned back.

After awhile my free license expired so I contacted our re-sellers at LA CAD (now US CAD) and Precious Yong came to my office to confer on the matter. I had started the AUGI Revit Structure forum looking to solutions to problems but was looking for more support since this stuff was so new. When Precious told me there was no local users group I suggested that we should start one? So we did! I had never been a part of such a group so did not quite know what to expect. Several weeks later after work about ten of us held our first meeting at the LA CAD offices on Wilshire Boulevard in Los Angeles and the group has met monthly every since.

Precious continues to come to our meetings to this day, usually totting a few six packs of beer or some soda for us all.

When we began our group Revit version 5.1 had just been released and though exciting it was barely ready for primetime. For that first year I think the biggest question that was constantly being tossed around was “Why switch to Revit when we have Architectural Desktop?” People really needed to be convinced. Some never were. Now years later it is clear that the switch to Revit was the right way to go.

It was at one of those first meetings that I met Charles Keeley, the Autodesk Territory Manager in our area. In this nascent period of the BIM revolution both Chuck and I could see something big approaching, like a storm off in the distance. We often spoke about it. Chuck became our most enthusiastic evangelist for the massive change that was about to hit the AEC Industry as well as a great supporter of our users group. It was not guaranteed that Revit would succeed as it has, but in the end it appears we both made the right bet. Chuck has supported us consistently ever since. Of course that means buying the pizza every month, and helping to line up presentations for us, and all the behind the scenes work that goes into running this group that few can appreciate.

Jay Zallan started doing presentations for our monthly meetings when he was working with LA CAD, bringing his mastery of Revit and BIM techniques to our meetings. He then went to work for Gensler Architects in Santa Monica as Southwest Region Virtual Design & Construction Manager. When he joined Gensler his involvement in the LARUG grew even larger and soon he became an integral part of the organization. No longer content to be just a member he stepped up and became the Co-Chairman, bringing his energy, interest and expertise along with him. Never shy to give his opinion on a subject Jay has provoked some rollicking and rolling discussions over the years. But that’s what it’s about for us, believing with passion in what we are doing and having this wonderful group to express our opinions with our peers and for us to hear theirs.

We get it! BIM is about collaboration: Architectural, Structural, Civil, MEP, Construction, Facilities Management, etc. For that reason we have always maintained a multi-discipline approach with this group. Jay and I have steadfastly refused to break into different discipline specific groups, opting instead to concentrate on the issues of collaboration, interoperability, design/build and other areas of common ground. We believe that is the main battleground that needs to be explored and rationalized as the process and work flow of this new design paradigm evolves and matures. This environment of collaboration is more in line with the future (and present) nature and needs of the AEC community. Instead of having discipline specific meetings our approach is much more able to help foster collaboration; which is at the heart of any successful Revit & BIM project and perhaps the only hope in stopping the unnecessary waste in the AEC world.

So how are our monthly meetings structured?

LOCATIONS

We have no permanent meeting location but instead must secure a venue each month. We believe that traveling to various offices through-

out the city is one of our strengths; although some might say it is a weakness (we don’t think so). Even though the LARUG has no permanent home we enjoy the sense of being a traveling Wild West Revit Show. We outgrew our initial home at LACAD soon after we began having meetings and so we began to meet at various AEC firms in the Los Angeles area and this continues today. Securing a site each month can be difficult, having to deal with the security, parking, food deliveries and such issues for each location. But on the other hand we have had the great opportunity to visit some of the best architectural, and engineering offices in the country such as architectural firms Gensler, RTKL, HNTB and the engineering offices of John A. Martin and Brandow & Johnston. What a great chance to see what the other guy is doing and what a great way for them to show off their stuff.

PEOPLE

It’s the people that make our group special. With over 400 registered members we can expect a good sized crowd each month of between 50 and 100 attendees. Some are students, architects, engineers, contractors, professors; some are principals of firms, and some are just interested in the subject. All are welcome and many have been coming for years. To watch as some of them went from Revit novice to Revit masters is very satisfying. We wish we could list each LARUG member here because every individual brings their special energy and expertise when they attend and we encourage everyone to participate by bringing their ideas, questions, and to give presentations of their own work.

THE INDIA CONNECTION

The world continues to get smaller and smaller as the communication revolution continues. Jay traveled to India last year to teach Revit & BIM processes to an Architecture firm in Bangalore (Bangaluru). He guided the formation of and kicked off RUG-B; aka: Revit Users Group Bangalore that is now being run by Murugan Pannir and others from Studio-I Architects. We are very pleased that LARUG has this Sister-RUG half a world away and the hookup with Revit users worldwide continues to grow digitally, into the twit-o-blog-o-web-o-sphere with the help of Cody Nowak our Digital Coordinator.

BUSINESS

Lots of people have a purist mindset about how meetings should be organized preferring not to make the meetings business opportunities. We have never agreed totally with that approach. We think the meetings do have a lot to do with business, though not through overt sales pitches. Networking and getting to know our peers in a relaxed environment (did I mention the beer) has been the beginning of some great business associations, job offers, and friendships such as the one Jay and I have developed.

RESOURCES

The logistics of putting meetings together can be real drudge work. Month after month having to find venues, arrange presentations, and figure out the parking and security situation can be a real chore. We do not collect dues from the membership so all our efforts are purely voluntary. We get donations of food and refreshments from Autodesk, as well as from Kelar Pacific, Microdesk, AEC Factory and US CAD. These resellers are a dedicated bunch of

AUGI local chapters

professionals who play an indispensable part in all of this, bringing their training skills, BIM knowledge and software support to our members. With the pace of change outstripping our ability to keep up with all of the new BIM tools that are constantly being created and offered we rely on them to help keep us updated.

So how is a typical meeting structure? User participation is the fundamental key to creating a dynamic meeting. Jay and I try to promote involvement wherever and whenever we can.

The usual meeting has these parts:

- a. Schedules 6:00-8:30 PM on the third Wednesday of the month
- b. Of course, Pizza, Beer and cookies (OK, sometimes firms won't let us bring the beer)
- c. Individual presentations by our host firm. Some of which included:
 - i. *Massing tools and their application.*
 - ii. *The house that Revit built and the Volcano that Revit built.*
 - iii. *The Rose Bowl project.*
 - iv. *The LA Live Marriott hotel project.*
 - v. *LIDAR & Holograms for AEC.*
 - vi. *So many more.*
- d. Tips and Tricks segments are presented from time to time but most of our normal presentations go so far beyond simple tips and tricks that we believe these deeper technique studies are far more valuable. The Blog-o-sphere is the best place to get smaller tips and tricks anyhow...
- e. Open discussions.
 - i. *We don't hold back our opinions and experience here. We try to facilitate interesting discussions. Everyone is welcome to participate and at times required to join in.*
- f. New product rollouts
 - i. *New Revit versions come out in April (like all Autodesk products) and so our meeting that month is dedicated to exploring what's new; plus when the press blackout is lifted we normally get early sneak peeks at what's coming.*
- g. Guest Speakers are too numerous to name individually but suffice it to say we continue to have the pleasure of welcoming guest presenters spanning the entire gamut of AEC, from Autodesk to Architects, Engineers and Hardware & Software vendors and AEC visionaries.

THE FUTURE

We are in development of a digital rebirth at LARUG, the results of which will be our sharing and opening up the LARUG globally; through web-casts and the like. This has actually been asked for by folks from all around the world so we are very excited for the future growth of Revit and the LARUG itself. With Cody's help we are going virtual, establishing LARUG LinkedIn, and Twitter, sites to get our information to all of our users all of the time.

But when we look to the future we cannot escape the dark shadow of the recent past. Like everyone else we have been devastated by the impact of the Great Recession. Many of our members have lost their jobs which may never return. We hope that our continuing efforts will assist them in keeping up their skills while they wait for the economy to recover.

SUMMARY

It seems that the evolution of Building Information Modeling is moving beyond its nascent stage into its next phase: becoming the industry standard throughout the world, powered by the incredible synergy that has been created through the development of modern computer hardware, software like Revit, and through the efforts of people like the esteemed members of our users group. Jay and I and our members have watched in wonder and excitement as these changes have unfolded. In Los Angeles we have been riding the crest of that wave with toes hooked over the front edge of our surfboard, out on the edge. As we look from side to side we see our fellow LARUG compatriots right there with us, all of us asking, "What's next?"

Tom is Associate Principal and Director of BIM & CAD Operations at Brandow & Johnston Inc., a structural and civil engineering consulting firm in Los Angeles, California where he has worked for the past 28 years. An early adopter and enthusiast of Revit modeling software, he is the founder and co-president of the Los Angeles Revit Users Group. Tom wrote the first AOTC Revit Structure Essentials manual for Autodesk, is a moderator on the AUGI Revit Structure forum, and has taught at Autodesk University for the past four years. He is a frequent speaker and is co-author of Mastering Revit Structure 2009 published by Wiley Publishing.



Art - Architecture - Technology - Ideas – These are Jay B. Zallan's professional passions. He is a Designer, an Artist and a BIM futurist. Jay has more than 20 years of Architectural experience and enjoys a varied & diverse portfolio ranging from High-end Custom Residential Design to large Mixed Use Development projects as well as many practice areas between. He is the Co-President of the Los Angeles Revit Users Group and one of the few people with Autodesk ICE (Implementation Certified Expert) qualification.



Jay is the VDC Director of BIM at Perkowitz+Ruth Architects & Studio-111. He brings unique & qualified insights into the business & creative processes of Architecture with proven strategies for production & growth.

He frequently speaks and consults on BIM and Virtual Design & Construction. Jay is a recurring presenter at Autodesk University and presents at Universities and other industry events, as well as for the AIA. He is a certified Instructor for Revit, AutoCAD Architecture and AutoCAD and has taught thousands of Architects and Engineers how to use and integrate technology to further their business goals.

As an Artist Jay works in a variety of styles & media, constantly experimenting with subject, concept and material. Most works are iconic, large, multi-panel mixed media works. Jay also teaches Art, Architecture & Creativity classes both privately and as a frequently invited guest instructor at the Los Angeles County Museum of Art (LACMA). Enabling, empowering and inspiring others to realize their own dreams and creative potentials beyond limitations whether real or perceived.

In Revit, Little Details Count Too!



INTRODUCTION

In the final stages of project presentations, scenes are embellished with the addition of furniture and other 3D content. For a lot of users, this is done by exporting their projects to another application where renderings and walkthroughs are also generated. However, this comes at a price of having to own another software and maintaining another person to operate it. Well, things are slowly changing as more and more users are discovering the power of mental ray® renderer that's integrated in Revit.

For new users, mental ray® is an industry-standard high performance rendering software which produces photorealistic material and light simulation. Owned by mental images® (a subsidiary of NVIDIA Corporation), it is the software that is integrated in leading 3D modeling and rendering programs. Autodesk had the insight to integrate this powerful renderer into Revit. And now with the new generation of i-series Intel processors, rendering times have been shortened dramatically. You can now buy a powerful i7-930 CPU desktop computer for around \$1,300. This is one of the fastest processors in the market today. Clearly, hardware is slowly catching up with the processing demands of 3D visualization. After producing several projects in Revit and creating hundreds of complex families, I know we don't have to go outside of Revit for our basic visualization needs.

Through this article and upcoming blogs, I am hoping to share the knowledge I gained in creating quality digital content. Here are a few of them:

USE THE QUICK ACCESS TOOLBAR (QAT) TO YOUR ADVANTAGE

With the 2011 release, it is now a breeze to customize the QAT. As in version 2010, tools are added by right-clicking on top of a Ribbon tool icon and clicking 'Add to Quick Access Toolbar' (Figure 1).



Figure 1 - Adding tool icons to the QAT

At the far right of the QAT is a little arrow (A, Figure 2) which you click to access a drop-down menu (B, Figure 2). In this menu, you'll see a list of tools already in the QAT which you can activate or deactivate. Clicking the Customize Quick Access Toolbar (C, Figure 2) takes you to another window (D, Figure 2) where you can move or remove tools and add or remove spacers (note: you can select more than one item by holding down the control or shift key or dragging your cursor).

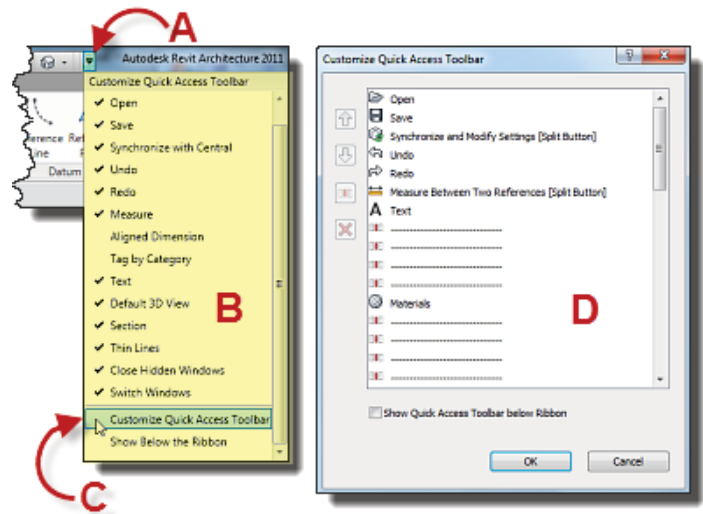


Figure 2 - Quick Access Toolbar (QAT) menu

If you relocate the QAT below the ribbon, there is less mouse travel. In the QAT sample shown on Figure 3, multiple spacers were added to separate most commonly used tools into groups. This makes it easy to see the tools in the peripheral vision while modeling.

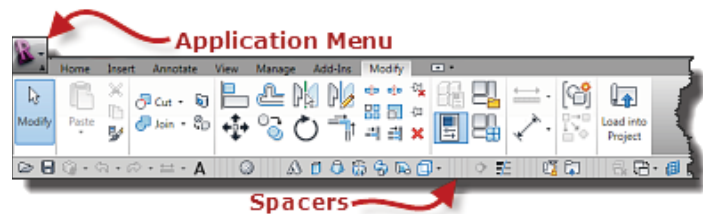


Figure 3 - Sample QAT setup

In the Family editor, the most frequently used tabs are the Home tab (where the Form tools are located) and the Modify Tab. By locating the Form tools in the QAT and setting the Tab Display Behavior (Revit Applications Menu>Options>User Interface) to 'Stay on the Modify Tab', you'll have a one click access to most of your tools.

To compensate for the loss of about a quarter inch screen space when you relocate the QAT below the Ribbon, do this:

- Maximize your Revit window
- Set your Taskbar to display small icons to gain about 1/8" screen space
- Right-click on the gray blank space on the far right of the Ribbon (Figure 4) and take out the check mark from the Show Panel Tiles. This hides the names of the Ribbon panels and moves the QAT up by 1/8".



Figure 4 - Gaining screen space

OTHER RIBBON DISPLAY SETTINGS

There are three other Ribbon display settings to maximize your screen space. They are:

- Minimize to Tabs
- Minimize to Panel Tiles
- Minimize to Panel Buttons

By clicking on the downward facing triangle button (A, Figure 5), you get to choose among these three other Ribbon display settings from a drop-down menu (B, Figure 5). The enclosed triangle button (C, Figure 5) toggles the display between the original default Ribbon setting and what you've chosen from the three. When nothing is chosen, clicking this button cycles through all the display settings.

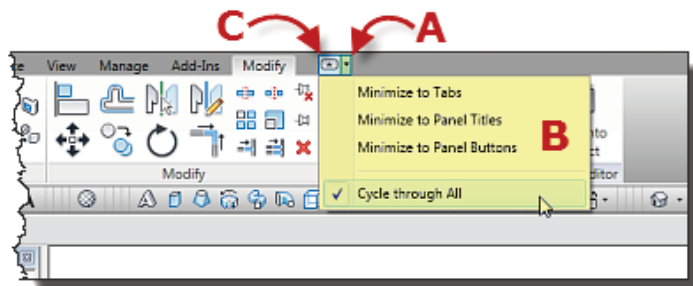


Figure 5 - Menu to access additional display settings

HERE'S WHAT YOU NEED TO KNOW ABOUT THESE SETTINGS:

- Minimize to Tabs (A, Figure 6): You gain the most screen space with this setting which is approximately 1 3/8". All you see are that tabs and the QAT. When you click any of the tabs, the corresponding panel and its tools pop out (B, Figure 6).
- Minimize to Panel Tiles (Figure 7): You gain approximately 1 1/8" screen space with this setting. A second row is added below the tabs which are the panel names. After you click on a tab, tools automatically pop out when you hover over any of the panel names.
- Minimize to Panel Buttons (Figure 8): You gain about half an inch with this setting. Buttons are added below the tabs which consist of a Panel name and a tool icon. After you click on a tab, tools automatically pop out when you hover over any of the buttons.

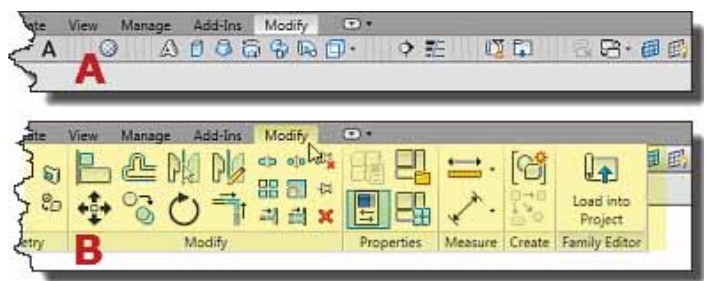


Figure 6 - Minimize to Tabs

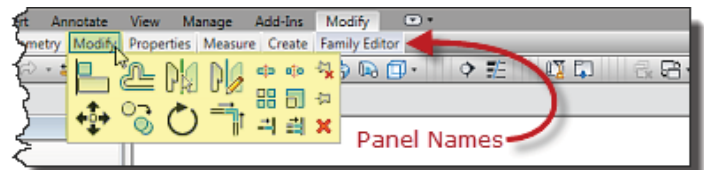


Figure 7 - Minimize to Panel Tiles

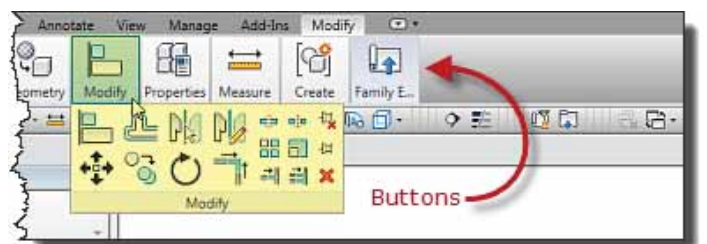


Figure 8 - Minimize to Panel Buttons

These configurations, along with being able to pull out the panels or rearrange the tabs, give us a lot of flexibility to adjust our Revit drawing area. However, there are trade-offs when you choose a particular setup. With the three settings above, the screen space you gain means making an extra click before you get any tool. It's all a matter of preference. As long as you're comfortable with a particular setup that's efficient, then that's all that matters.

KEYBOARD SHORTCUTS

We all know the advantages of keyboard shortcuts. Although you can configure your Ribbon/QAT setup for a one click access to tools as in Figure 3, you can save more time with keyboard shortcuts. You can also combine both keyboard shortcuts and clicking on tool icons. Here are a few things to consider:

1. Familiarize yourself with all the tools in the Ribbon. Study their function and memorize which tabs they belong to. They are grouped by functionality so it's not that hard to associate them with the right tabs. This way, in case you forget a keyboard shortcut for a particular tool, you'll know where to find it from the Ribbon. Try out all the tools and commands to see how they work. Make a list of the tools you use often. Then when you're ready, customize your keyboard shortcuts.

2. RA 2011 has a new customizable Keyboard Shortcuts interface accessed by typing KS (yes_the Keyboard Shortcuts dialog box has a keyboard shortcut too!). Or you can go to View tab>Windows panel>User Interface>Keyboard Shortcuts. The dialog box that pops out (Figure 9) has a Search field (A, Figure 9) for finding a par-

ticular command. There is also a Filter drop-down menu (B, Figure 9) to narrow down your search. Before you customize any of the keyboard shortcuts, print a copy of the default keyboard shortcuts by clicking Export (C, Figure 9). You will be prompted to save the file as an XML file which can then be opened with a spreadsheet program.

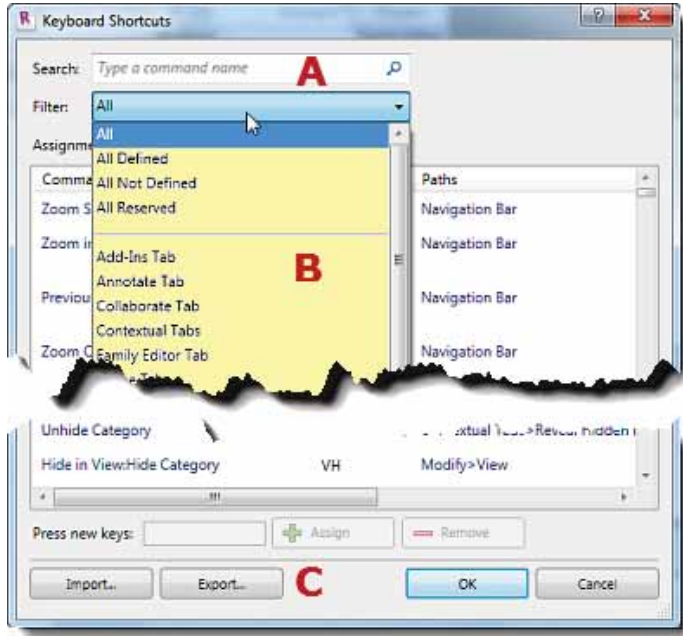


Figure 9 - Keyboard Shortcuts menu

3. Here are the rules for keyboard shortcuts:

- You can assign up to 5 unique alphanumeric keys
- You can combine keyboard modifier keys (Shift, Ctrl and Alt) with one alphanumeric key
- If you use the Alt key, you must also include Shift and/or Ctrl
- You cannot alter Reserved keys
- You can assign multiple keyboard shortcut for each tool
- You can assign the same shortcuts to multiple tools

4. When assigning keyboard shortcuts, try to use meaningful letter combinations that's associated with the tool. Here's a sample keyboard shortcuts for the Form tools:

- Solid Extrusion: EX
- Solid Blend: BL
- Solid Revolve: RE
- Sweep: SW
- Swept Blend: SB
- Void Extrusion: VEX
- Void Blend: VBL
- Void Revolve: VRE
- Void Sweep: VSW
- Void Swept Blend: VSB

Note: You can replace pre-assigned Revit Keyboard shortcuts but not the reserved ones.

5. Most of the action in family modeling occurs when you are taken to the Sketch mode after clicking a Form tool, Symbolic line or

Model line. The Draw panel (Figure 10) will appear along with other contextual menu items. It will be to your advantage if you assign keyboard shortcuts to the tools inside the Draw panel.

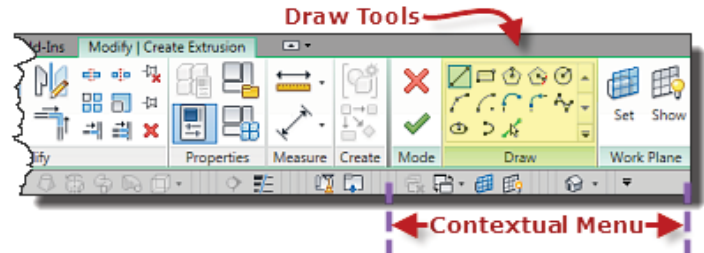


Figure 10 - Draw panel

Here is a sample keyboard shortcuts for these tools:

- Line: LI
- Pick Lines: PL
- Tangent End Arc: TE
- Rectangle: RC
- Circle: CI
- Center Ends Arc: CE
- Ellipse: ES
- Partial Ellipse: PE
- Inscribed Polygon: IP
- Fillet Arc: FA

6. If you forget a keyboard shortcut, just hover on top of the tool icon in the Ribbon and the Tooltips window will appear. The keyboard shortcut assigned will be right next to the tool name as shown in Figure 11.

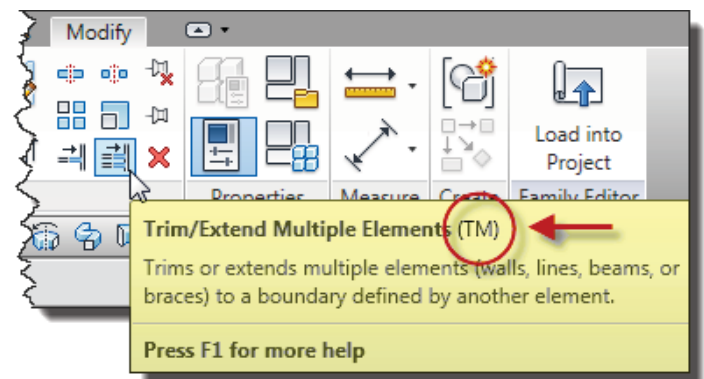


Figure 11 - Tooltips

7. If you only remember the first letter of your keyboard shortcut, just type it and look down at the bottom left of your Revit drawing area (Figure 12). This is the status bar. You'll see the letter you just typed plus the corresponding second and/or third letters. You'll also see a short description of the tool function and its panel location. When you click your keyboard arrow key, the text content cycles through any other keyboard shortcut for other tools that starts with the letter you just typed.

8. Keytips is another way of accessing the Application menu, Ribbon tabs and the QAT by keyboard. When you press the Alt key, little square boxes with preset letters or numbers appear (Figure 13). It stays there till you press any key or click the mouse. Pressing

the Alt key and a character from one of the boxes opens up the corresponding tab, menu or tool.

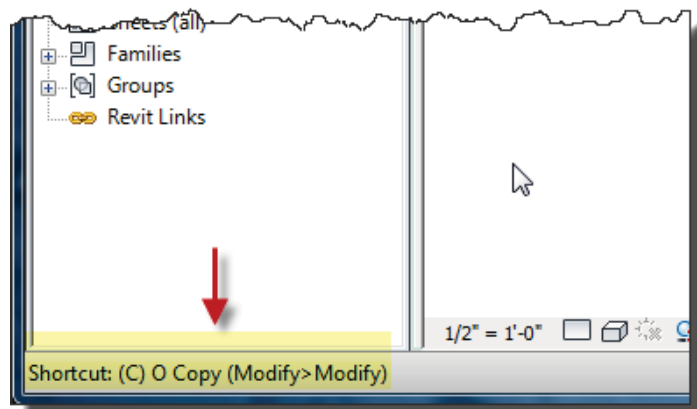


Figure 12 - Status bar

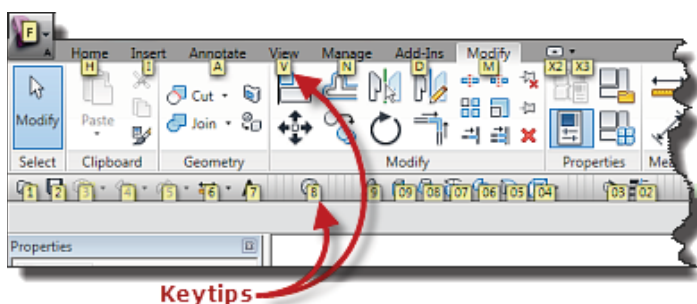


Figure 13 - Keytips

I believe a better implementation of the Alt key's capability is to display our keyboard shortcuts. The keytips adds redundancy to the keyboard shortcuts that had already been assigned for the tools in the QAT.

THE WORK PLANE

Simply put, the Revit work plane in the Family environment is the surface where you sketch or model on. You can't just model in space without a work plane. You need a surface to work on. These work planes can be any of the following:

- Level: this is the default horizontal plane called 'Ref. Level' (reference level). You'll see this label when you're in any of the elevation views. When you start to model in plan view, your extrusion will start at this level unless you specify another work plane.
- Reference Planes: These are the green dashed lines which you use as guidelines or construction lines for sketching. Their lengths are infinite and have no start or end points. What you're drawing is a symbolic representation of that infinite plane. Reference Planes are also used to drive geometry when you add dimensions between them and assign parameters. When you name a reference plane, it automatically becomes a work plane and gets added as a choice from the dialog boxes shown in Figure 14. These two dialog boxes have the same window content. The differences are their names (A & B, Figure 14), where they are accessed from and the views you get when you access them. Family templates come with preset reference planes.

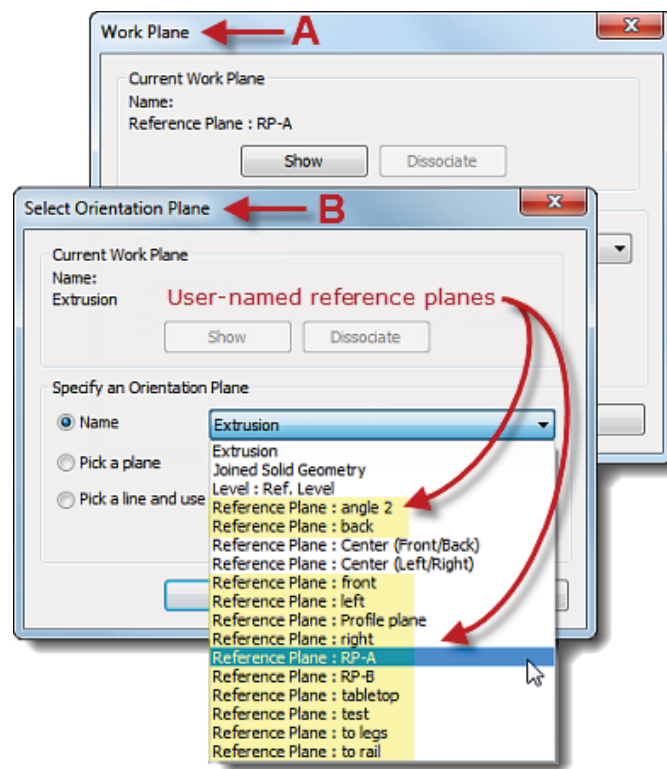


Figure 14 - Work Plane and Select Orientation Plane dialog boxes

- A face from an existing element.

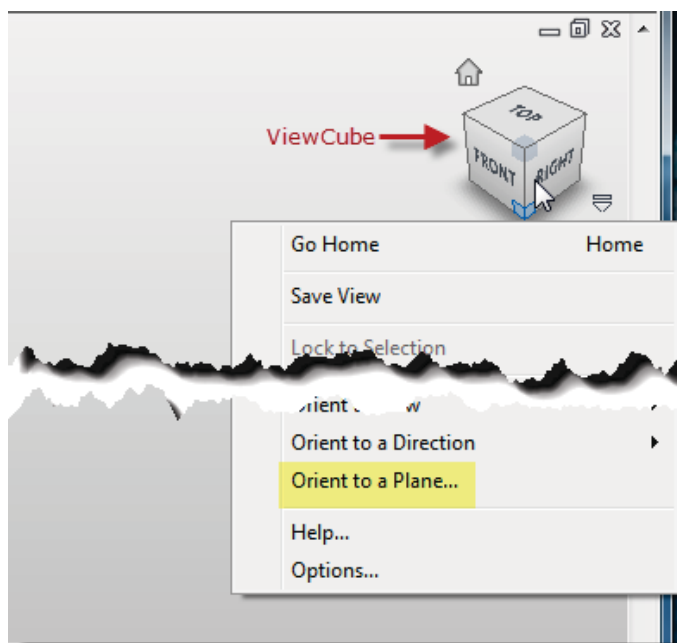


Figure 15 - ViewCube

The Work Plane dialog box (A, Figure 14) is accessed from the Set tool (Home tab>Work Plane panel). If you go to a view from this menu, your work plane will change but not the current view you're on. And if you select a view perpendicular to your current view, the Go To View dialog box pops out where you are prompted to select a view from a list. The Select Orientation Plane dialog box

(B, Figure 14) is accessed by right-clicking the ViewCube (Figure 15) and sliding down to 'Orient to a Plane'. Going to a named view from here or choosing 'Pick a Plane' will take you directly to a view parallel to the work plane you want to work on.

HOW TO MODEL ON TOP OF ANGLED SURFACES

In Figure 16, we see moldings and vine inlays at the angled side panels of a pool table.

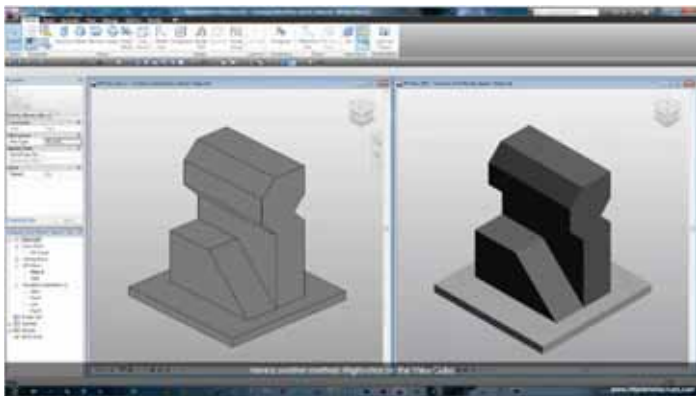


Figure 16 - Side panel details of a pool table

Just how do we go about modeling on top of angled surfaces? What's the most efficient way to do it? Here are three methods you can choose from:

1. Picking a face of an existing object:

In this method, when you click a face of an existing object, you're taken to the work plane of that face. I'll explain more about this on Video Clip-1.



Video Clip-1 - Modeling from a Face of an Existing Object

2. Modeling on a view parallel to a named reference plane:

In this method, you draw a reference plane on top of the angled surface you want to work on then type a name for it. This then becomes a work plane. Figure 17 shows the elevation views of the pool table example.

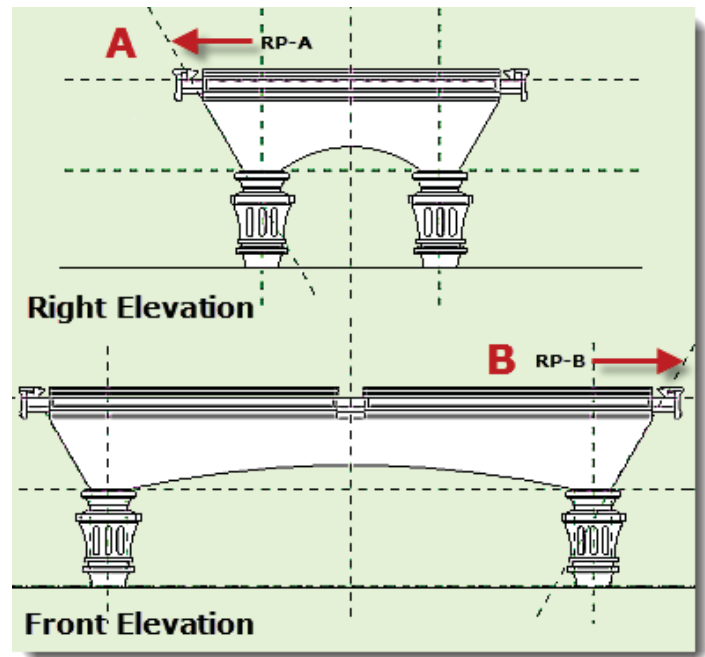
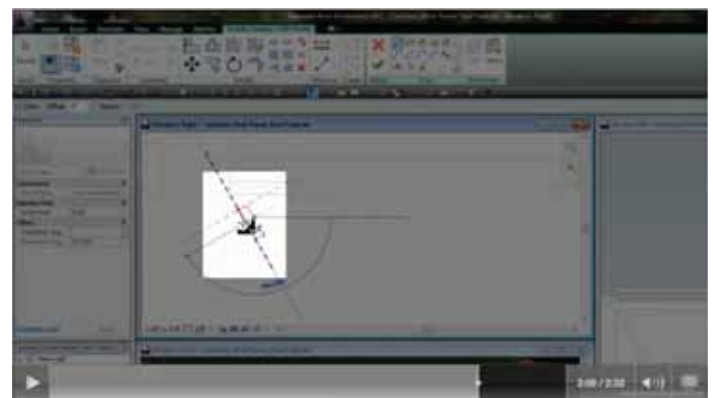


Figure 17 - Modeling on a view parallel to a named reference plane

On the Right elevation (A, Figure 17), a reference plane was drawn on top of the left edge of the panel and named RP-A. The same procedure was done for the Front elevation (B, Figure 17). A reference plane was drawn on top of the right edge of the panel and named RP-B. To continue with this procedure, please watch Video Clip-2.



Video Clip-2 - Modeling on top of a Named Reference Plane

3. Modeling from a section view:

The idea here is to model in front of the plane you want to work on from a section view. You cut a section and rotate it so that it's parallel to an angled reference plane (see Figure 18 below).

You then adjust the crop boundary so it's closer to the cut plane. The advantage of this method is that you can control how much geometry you can see beyond the section cut line. When you're at the section view, you'll see the plane without having to see the rest of the geometry. You then set your view to the reference plane of the face you'll be working on. Take a look at the following Video Clip-3:

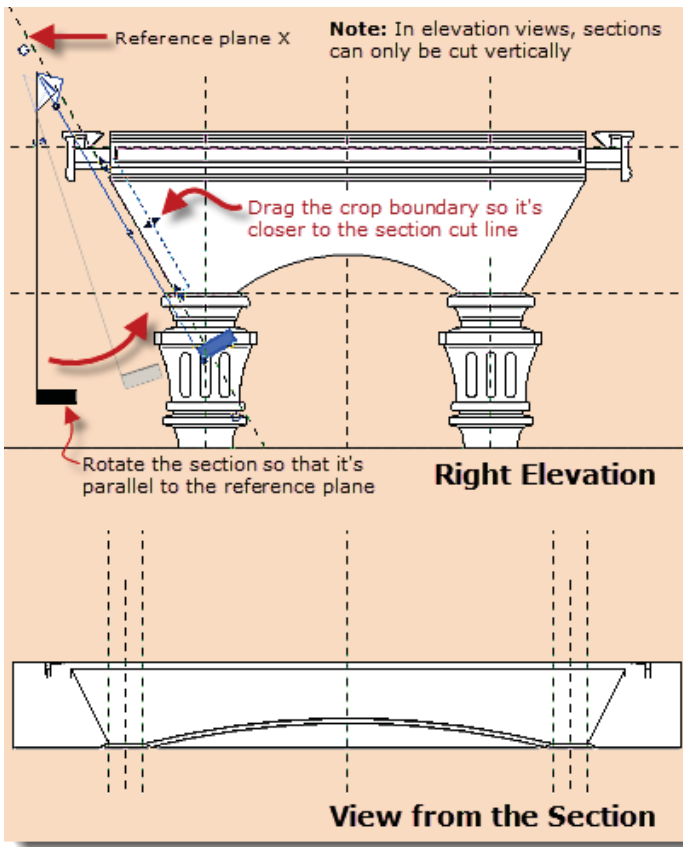


Figure 18 - Modeling from a section view

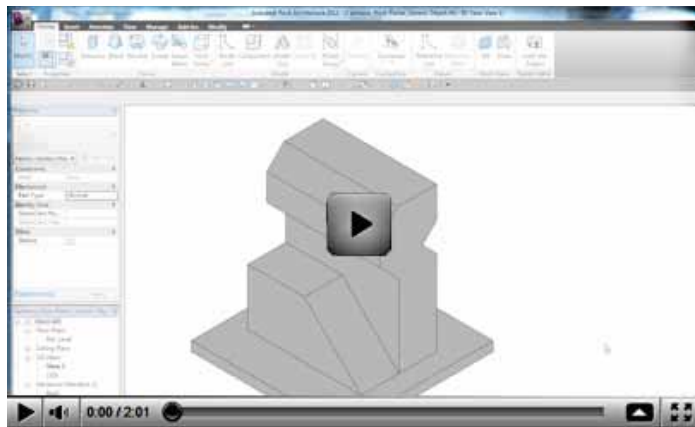


Figure 19 - Family Element Visibility Settings dialog box

One of the things you can do to enhance the look of model lines in your families is to assign different line weights to them. In the example shown on Figure 20, model lines with different thicknesses were used to represent the moldings.

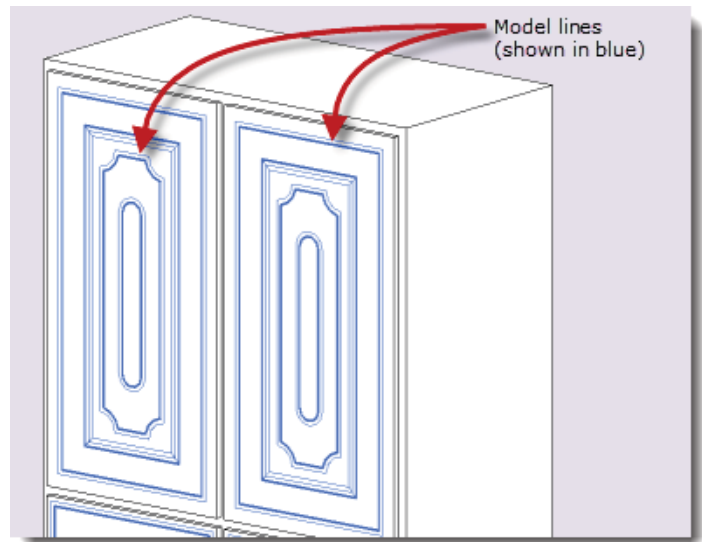


Figure 20 - Using different line thicknesses for model lines

Video Clip-3 - Modeling from a section view

MODEL LINES AND SYMBOLIC LINES

Model lines and symbolic lines are two other tools you can use to make your models more efficient in terms of file size and how fast they display on screen. Here are a few things to remember:

A. MODEL LINES:

Model Lines are 2D lines that show up in 3D views. Instead of creating extrusions, you can draw model lines to represent geometry. You can control their visibility from the Family Element Visibility Settings dialog box shown on Figure 19 (Properties palette>Graphics>Visibility/Graphics Overrides). Just like drawing extrusions, model lines have to be drawn on a work plane.

To add a new line weight, create a new subcategory in the Object Styles dialog box (Manage tab>Settings panel>Object Styles). Please be aware that although model lines will appear in all the views from the View Control bar, they will not appear in the mental ray render. Here is a comparison of four different views (Figure 21):

B. SYMBOLIC LINES:

Symbolic Lines are 2D lines that only shows up on views they were created from. They are great as symbolic representations of families on plan views (as well as elevation and section views) because they display fast.

Take a look at the two plan views of a casino craps table shown on Figure 22.

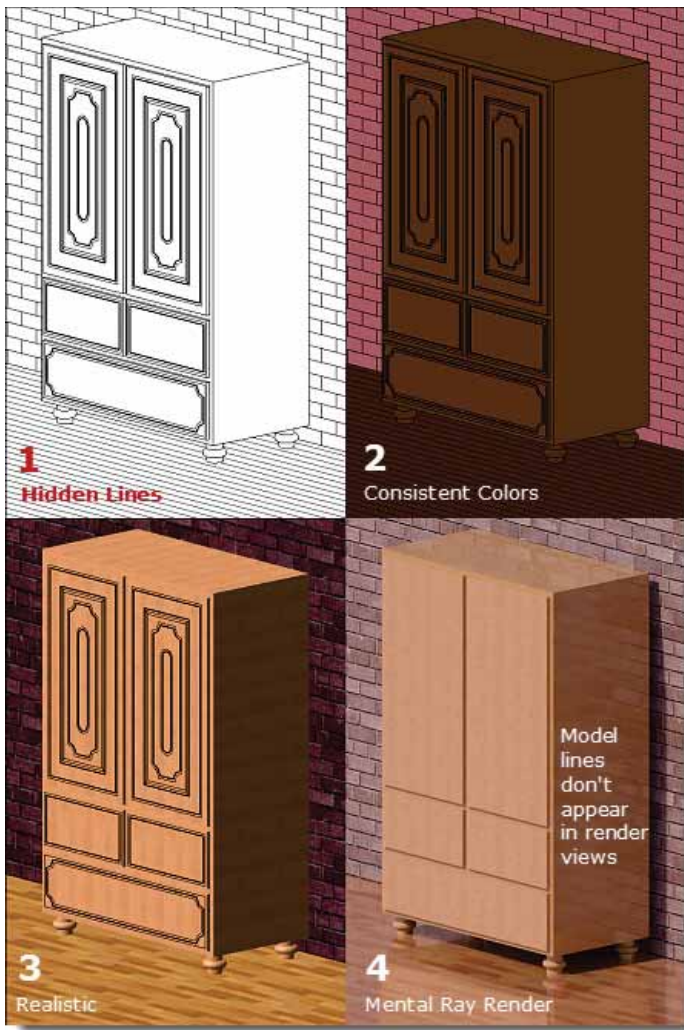


Figure 21 - Comparison of views showing model lines

Unless you're required to do a detailed colored presentation of a furniture layout (A, Figure 22), furniture symbols will suffice. The craps table symbol (B, Figure 22) are represented as purple 2D lines with a masking region (Annotate tab>Detail panel). The neat thing about this is it displays fast like a 2D family. The 3D elements are still there but were set not to display on floor plans.

HOW TO CREATE A PLAN VIEW FAMILY SYMBOL

A. CREATE YOUR MODEL AND SET THE VISIBILITY SETTINGS.

Depending on how complex your model is, there are two approaches to setting the visibility:

1. Set the visibility settings before modeling:
After you select a form tool, immediately go to the Properties palette>Visibility/Graphics Overrides and click Edit. In the Family Element Visibility Settings dialog box, check or uncheck the appropriate box or boxes. From then on, the visibility setting for that tool will default to what you just set. Do this for the rest of the solid Form tools you intend to use. Note that the Void Forms do not have visibility settings.

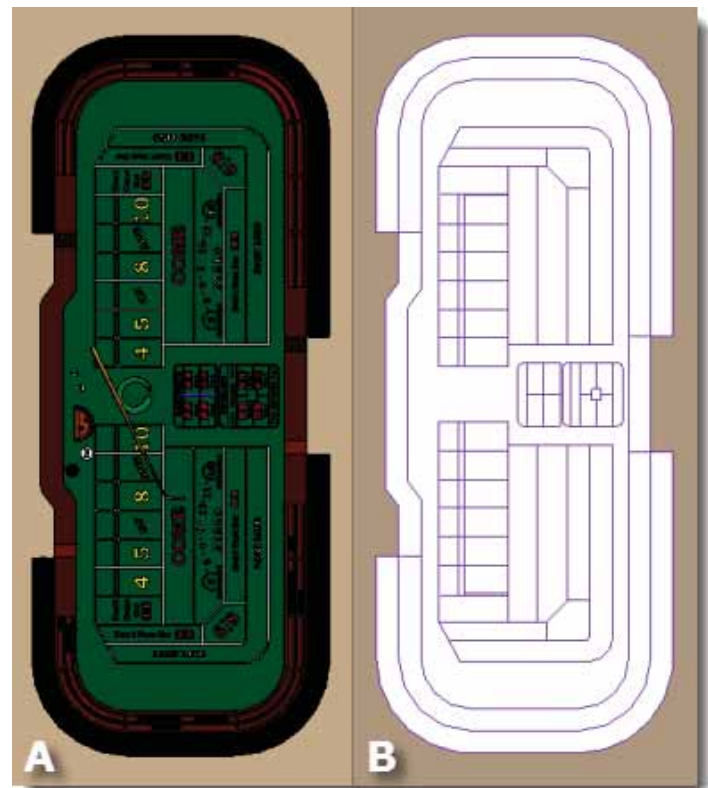


Figure 22 - Two plan views of a casino craps table

2. Set the visibility settings after modeling:
With families that contain simple shapes, this is easy to do. However, with complex families that contain numerous complex forms, void extrusions and nested families, it can be a little difficult. If you drag a selection window to select all the extrusions for setting their visibility, you have to make sure not to include any voids. Otherwise, the Visibility/Graphics Overrides will not be available in the Properties palette. Unfortunately, in the filter tool, solid and void extrusions are clumped together as 'other'. There's no way to filter out the voids. What you will end up doing is selectively clicking the solid extrusions and nested families.

B) DRAW THE PLAN VIEW FURNITURE SYMBOL USING SYMBOLIC LINES

In Figure 22 (B), symbolic lines were drawn inside the perimeter of the table while the boundary was created with a masking region (Annotate tab>Detail panel). When loaded in a project file, the masking region obscures the floor finish beneath it. If that's not the effect you want, of course you can use symbolic lines as boundaries. Here are a few things to consider when creating a family symbol:

1. As you're assigning visibility settings of your family's components, elements that you set not to display on plan views will appear as gray (A, Figure 23) with a thicker line weight.

The two exceptions are elements higher than the view range (B, Figure 23) and the model text (C, Figure 23). In the case of elements higher than the view range, just change the Top and Cut Plane heights of the View Range (Properties palette>Extents>View Range) to be higher than the tallest element. That way, elements below this view range

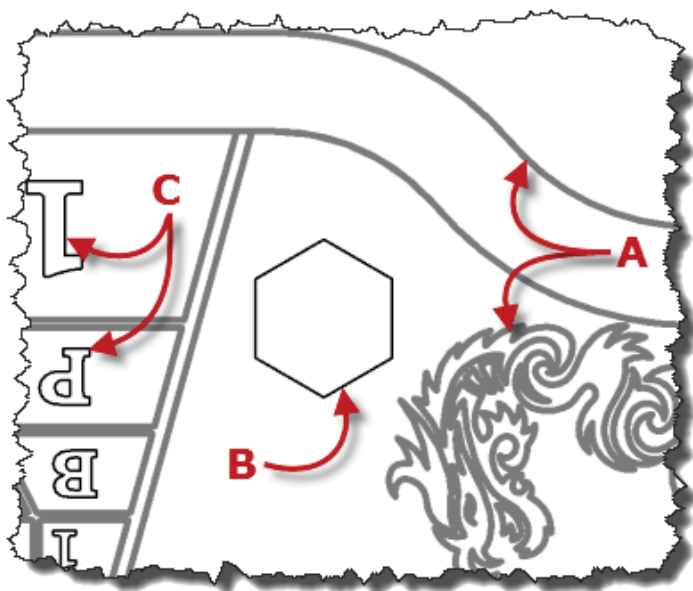


Figure 23 - Elements appearing as gray color

(which were set not to show on plan views) will appear as gray. The change in color is significant because of the following:

- It gives you a clue if your visibility settings are set correctly. Elements that you missed changing the visibility or modeled higher than the view range will display as black lines.
- The change in color makes it easier to draw the symbolic lines. Symbolic lines appear as black lines by default. However, you can change its color. Go to Manage tab>Settings panel>Object Styles and change the color to a different one. You can also choose to add a new line by clicking on New, naming the line category and specifying a different color (see Figure 24).

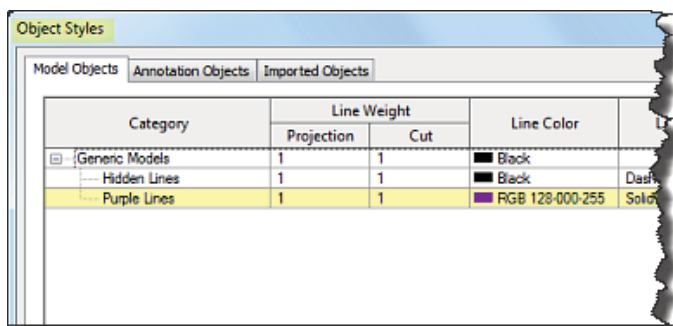


Figure 24 - Object Styles dialog box

- Symbolic lines and hatch regions don't need work planes. When you want to incorporate hatch regions, draw the symbolic lines first. When you're done, trace the outline of your model with the hatch region tool. It will not obscure the symbolic lines (but will obscure the model you're tracing if you drew it first).

2. If you have not set the visibility setting of your elements yet, here's another method of drawing the symbolic lines: Load your model into a new family template and save it as a temporary file. Now it will be a lot easier to trace the model. The loaded model acts as one entity and is easier to hide, unhide and move. When you're

done, go back to your original family and set the visibility settings of your elements. Then copy and paste the symbolic lines and hatch region from your temporary file to your original model.

THE FORM TOOLS

The Form tools are pretty straightforward. All of them are sketch-based and requires you to draw shapes and profiles in a 2D environment. After you click Finish, extrusions are created and shapes take form based on the method you use. Here are a few techniques I've learned in the process of creating the families on my website:

1. SMOOTHER TRANSITION OF ELEMENTS USING THE SOLID SWEEP BLEND TOOL:

This is also applicable to the Solid Blend tool. They are both used to transform one shape into another shape. Depending on how seamless you want them to morph to one another, you can control the smoothness of the transition.

In Figure 25 (A), Profile-1 was created with the rectangle tool.

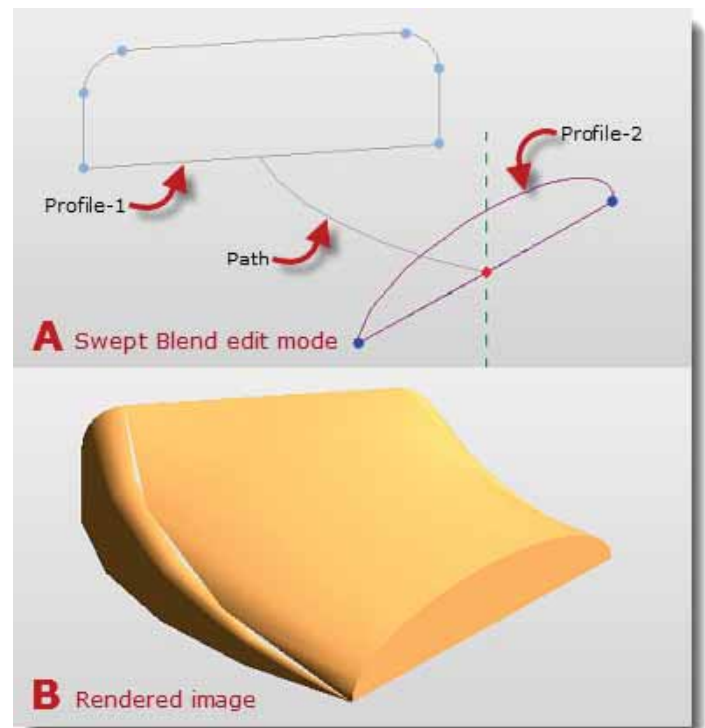


Figure 25 - Swept blend extrusion before adding vertices

The upper two corners were rounded with the Fillet Arc tool. This overall shape created 6 vertices at the location indicated by the blue dots. Profile-2 was created with a line and a partial ellipse tool. This created just two vertices. As you can see in Figure 25 (B), the number of vertices for both profiles affected the resulting shape. To make a smooth transformation, you have to add more vertices and have the same number of them on both profiles. Fortunately, we can manually add more vertices with the use of the Split Element tool (Modify tab>Modify panel) shown on Figure 26.

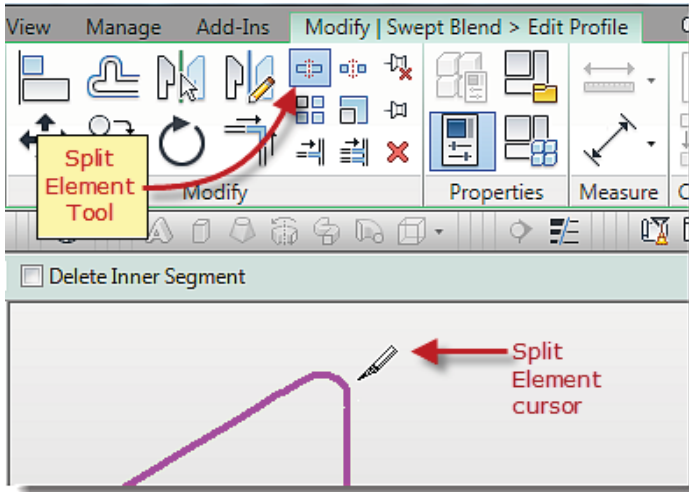


Figure 26 - The Split Element tool

For this shape, I just eyeballed where I wanted to split the lines and made 16 segments for each profile (A, Figure 27). Basically, I split one segment into two, then split the resulting two lines into their halves and so forth. Of course, I could have done the math to get equal split spacing. Figure 27 (B) shows the final result after adding more vertices.

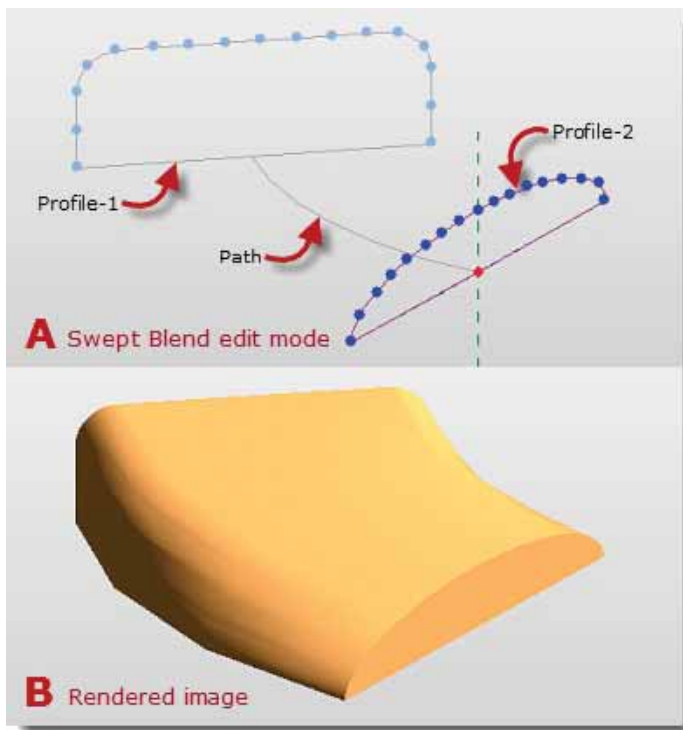


Figure 27 - Swept Blend extrusion after adding vertices

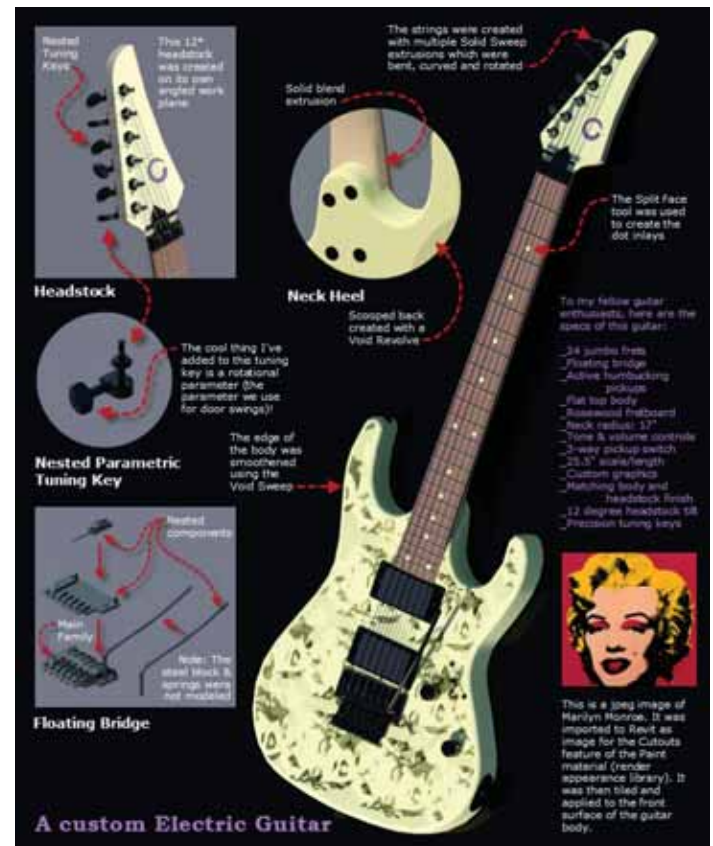
2. ROUNDING CORNERS:

This is a technique that adds a lot of realism to a model. Unfortunately, the family editor does not have a smoothing modifier or rounded corners options as found in 3ds Max. You have to manually round the corners of your elements using the Fillet Arc tool when you're in edit mode. Another way to do this is add a void sweep of

a rounded corner to an extrusion. Be aware that Revit has some limitations as far as how small you can draw. The smallest line, arc and fillet radius you can draw is approximately 1/32". There's also a point where round objects will display as faceted or segmented and not smooth when modeling small objects. The example you are about to view in the following clip is the wood enclosure of a speaker cabinet used by guitar players.



Video Clip-4 - Rounding corners and edges of elements



The Power of the Revit Family Editor

3. NESTED FAMILIES THAT CUT OPENINGS ON OTHER ELEMENTS:

This is the type of family that scoops out a hole or cavity from another element and fills that hole with the family you created. Think of a recessed toilet paper holder or a medicine cabinet that's built inside a wall. To create one, you need to use a host based family template (wall based, ceiling based, floor based, face based or roof

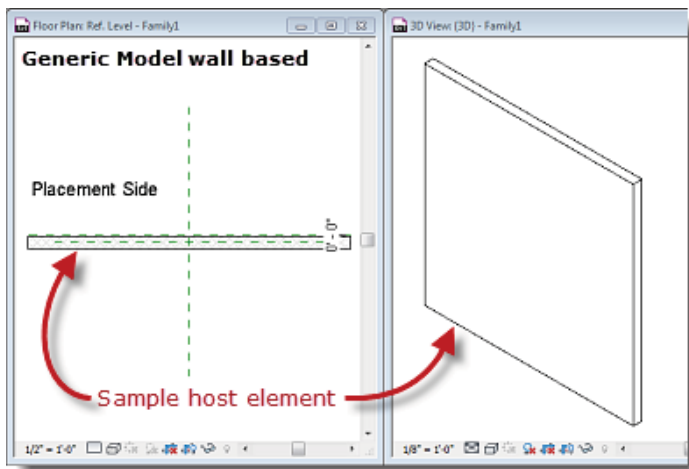


Figure 28 - Sample Host Element in hosted family templates

based). In all of these hosted family templates, you'll notice a solid surface included (Figure 28).

This object is a sample host element that represents the working plane where the family is going to be placed in a project. It is only present in host based family templates as a reference. It will not show up in a project file after you load the family.

In order to embed a family into a wall or another element, you need



Video Clip-5 - Creating a family that cuts openings

to cut a hole in the sample host element. This is created with the use of the Void Extrusion tool and demonstrated in the following clip:

4. MODELING COMPLEX SHAPES WITH WALL THICKNESSES:

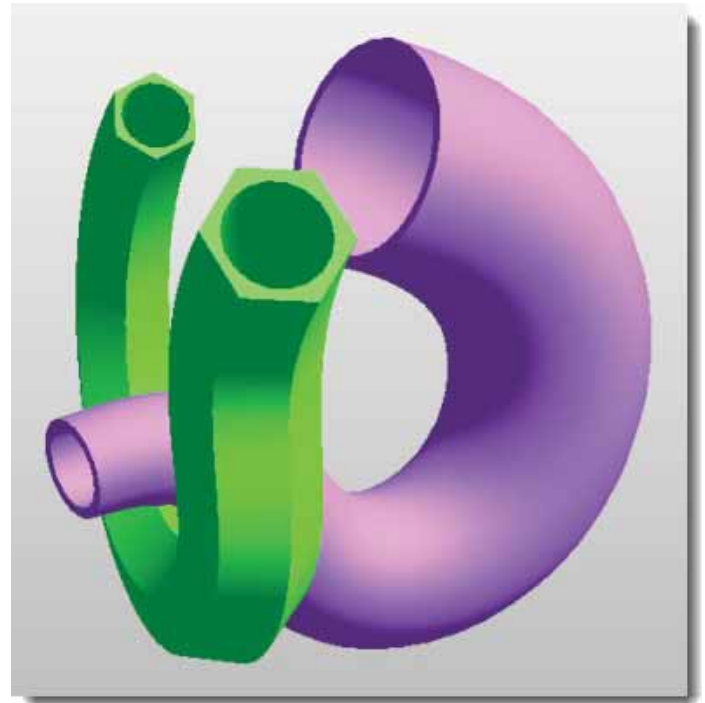


Figure 29 - Complex shapes with wall thicknesses

There are times when you need to model tube-like shapes with wall thicknesses (decorative sculptures, vases, organic shapes, etc.). In the example shown on Figure 29, the shapes were created with a



Video Clip-6 - Creating complex shapes with wall thicknesses

Solid Swept Blend tool.

However, this tool only allows one closed loop per profile. So how do we create the wall thickness? The quickest way to do this is demonstrated in the following clip:

5. USING RENDER MATERIALS TO REPRESENT COMPLEX GEOMETRIES:

The render Materials Properties has a feature called Cutouts. The intent of cutouts is to simulate holes or openings in the render ap-

pearance of an element. An example is a chain link fence (Render Appearance Library>Sitework>Chain Link Fencing). Instead of

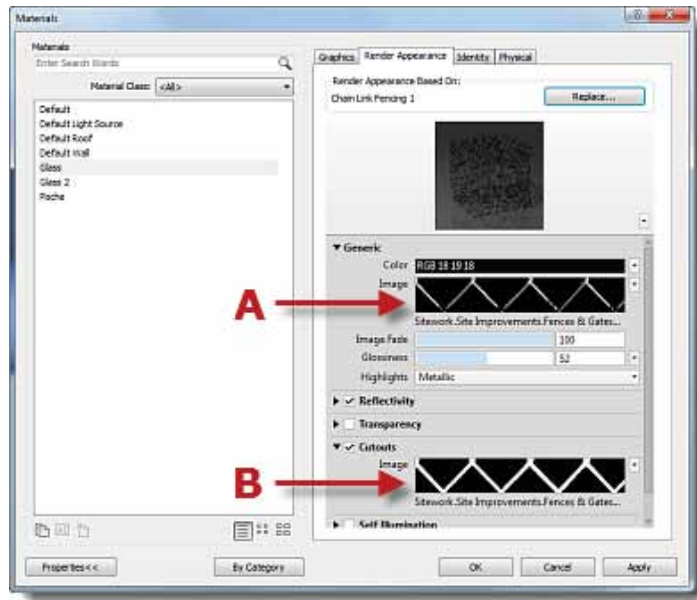


Figure 30 - The Render Appearance tab showing the Cutouts feature

modeling the actual geometry, its appearance can be simulated with the use of a graphics image of a chain link fence (A & B, Figure 30). The black areas appear as holes that you can see through in Realistic and Render views. This feature can also be applied to wall materials in a Project file.

Aside from the obvious advantage of representing complex geometries as graphical images, the other advantages of cutouts are the following:

- + You have the flexibility of applying all the material property settings found in the Render Appearance tab of the Materials dialog box.



Video Clip-7 - Cutouts

- + You can create your own custom image file as cutouts
Note: When you want to share a family with a custom cutout, you have to include the image file or specify the location where the file is saved.

Here's a clip showing how materials with cutouts appear in Realistic view as it is being moved in real time:



Video Clip-8 - Adding parameters to nested families

6. NESTING:

Nesting is an invaluable aid in the creation of detailed and complex families. Basically, you're creating parts of your family separately in another family file and loading them back. The advantage is that they act as one element that can be duplicated as many times as you want. They are great as components for adding dimension parameters. Here is clip showing how parameters are added to nested components.

CONCLUSION

For now, these are just a few useful information I wanted to share pertaining to the Revit family editor tools and family creation. They are practical techniques and methods I discovered and learned from other sources in creating complex families. Hopefully, they will add knowledge to your Revit skills.

The bottom line is, it's what you put in your work that will make your family or project accurate and look realistic. You have to make an extra effort to understand how the editor tools work and how solid and void forms can be used together to create complex families. But understanding them will not be of good use if you don't practice. This type of work can be tedious and time consuming for those who don't have enough 3D modeling experience. Unless your main job responsibility calls for just creating families, I doubt if you can get to experiment at your workplace. If you can, that's great. If not, your best bet is to practice at home. Download the Revit free 30-day trial software. It's a fully functional version that lets you save and print your files. After 30-days, the save and print functionality will expire but you can still use the program. If you need to have a record of what you've done, just print to screen or use any other screen capture program. Educate yourself and stay on top of the latest in BIM and Revit. The internet is abound with numerous Revit websites and blogs. We are blessed to have access to these great sites with information that are free for the taking. Take advantage of them. I do. I bookmark them in my browser. I also print and compile a lot of useful articles I

find. You can also watch a lot of Revit family tutorial movies from YouTube.com.

Finally, let me end this article by giving you links to just a few of the many great Revit websites out there:

<http://forums.augi.com/forumdisplay.php?f=93>
<http://revitoped.blogspot.com/>
<http://bimboom.blogspot.com/>
<http://therevitkid.blogspot.com/>
<http://clubrevit.com/>
<http://autodesk-revit.blogspot.com/>



Video Clip-9 - Guitar walkthrough - turn up your speakers!



The Power of Revit's built-in mental ray® renderer

<http://blog.cadway.com.au/>
<http://www.caddigest.com/>
<http://www.revitcity.com/forums.php>
<http://cad-vs-bim.blogspot.com/>
<http://www.architecture-tech.com/>
<http://do-u-revit.blogspot.com/>

WAIT, GOT ANOTHER 30 SECONDS?

Then turn up your speakers and play the following movie!

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Michael's 3D modeling experience began in 1993. While beta testing a Macintosh 2D software called PowerCADD, he stumbled upon a relatively unknown 3D modeling program called DesignWorkshop. He became enamored with it and studied the program diligently. In time, he mastered DesignWorkshop and introduced it to two other firms. In 1997, he got the chance to use DesignWorkshop extensively when a Santa Monica, CA architectural firm, headed by Architect Douglas Teiger (now with Abramson Teiger Architects), hired him. Mr. Teiger shared Michael's passion in using 3d visualization for conceptualization, design and presentations. He encouraged and supported Michael with the use of this program for the next 4 years.



After 9/11, Michael moved to Las Vegas where he worked for other firms. This time, he was using AutoCad and Sketchup. For 5 years, he concentrated on construction document detailing while honing his Sketchup skills. His Revit experience began in 2006 when he got hired by Friedmutter Group, a well known architectural firm that specializes in large scale Hospitality and Entertainment projects. With this company, he was able to use Revit fulltime in generating construction documents of multi-million dollar casino projects. Noticing the lack of quality families geared towards the casino industry, he began to investigate how to create these complex furniture. Eventually, he became obsessed with creating Revit families. After work hours and during weekends, he delved into anything pertaining to the Revit family editor. What started as nightly experiments became a serious hobby when he amassed hundreds of families of appliances and furniture. The fruit of all this labor is his website, www.littledetailcount.com, which he launched in March 2010.

Also, he is an Autodesk Revit Architecture 2011 Certified Professional.

Series: Surviving the Residential Jungle with Revit

SUSTAINABLE EXPECTATIONS



Over 1.8 million homes are built in North America every year. Tight deadlines and small budgets are the norm. Clients have expectations of seeing fully rendered 3D models of their custom designs. Most clients demand many options and sustainable design features. How can a

home designer or builder survive?

In this first article of our series we will explore how a residential designer can set expectations, focus on Revit's strengths, and design more sustainable buildings. Along the way we will be getting input from Solares Architecture, a successful sustainable residential design firm. Let's learn a little bit about them.



Solares Architecture Inc. was founded in 2005 by Christine Lolley and Tom Knezic. Tom and Christine aim to bring together sustainable design with construction practices that have minimal environmental impact. Over the past 5 years, they have earned a reputation as local experts in Passive Solar Design. Their body of work includes an off-grid rural home, a centuries-old cottage renovation, and a laneway house in Toronto.

Christine and Tom studied at the University of Waterloo, both earning Bachelor of Environmental Studies and Master of Architecture degrees. They gained work experience at some of the world's leading architecture firms in London (UK) and New York City before moving back to Toronto to establish Solares. Christine and Tom are both LEED-accredited professionals and Tom is a Licensed Architect with the Ontario Association of Architects.

SETTING EXPECTATIONS

Don't do too much, too early. This is easier said than done. The client wants to see the model before you've really been able to explore options. Whether it's a new house, renovation or addition the key is to identify a baseline design. It may be harsh but the saying 'garbage in, garbage out' holds true even with Revit®. You need accurate as-built measurements, many photos and pictures of the clients desired design features. Renderings are good but can be time consuming. They can also drive a conversation off-track, from overall building shape and feel, to 'is THAT going to be the colour of the brick?'

How does Solares set the client's expectations of what to expect when working in a 3D and BIM environment?

Revit's 3D visualization capabilities have given Solares the power to show their clients realistic images of what their homes will look like throughout the entire design process. Seeing as most of their clients have never built a custom home before or worked with a designer, they are unfamiliar with typical architectural drawings such as elevations and building sections.

Autodesk Revit Architecture® allows Solares to create vignettes of the proposed house from varied angles, enabling clients to get a strong overall sense of the design. Being able to see this kind of realistic visualization during the design process empowers their clients to provide valuable feedback, something that is extremely important to this firm. Solares believes that designing a custom home needs to be a collaborative process between client and designer and Revit's ability to produce realistic renderings has been an invaluable design communication tool. It should be noted that client perceptions of software are not always what we expect. They may be amazed that we can change the size of a window before their eyes, yet wonder why we can't tell them how many wood studs there will be in the house. Balancing these unrealistic expectations can be tricky but is rewarding.

SETTING EXPECTATIONS: BILLING

Expectations also involve billing. When working in Revit®, clients tend to think that changes are so easy that they should be free. It's been said that 'Free' is not a good business model. It's important to adjust your billing so the client understands the implications of making changes along the way. Although you will still be spending time on construction documentation, including detailing, it will not be as much as in a 2D drafting software.

Does Solares do anything different for billing as compared to a traditional 2D workflow?

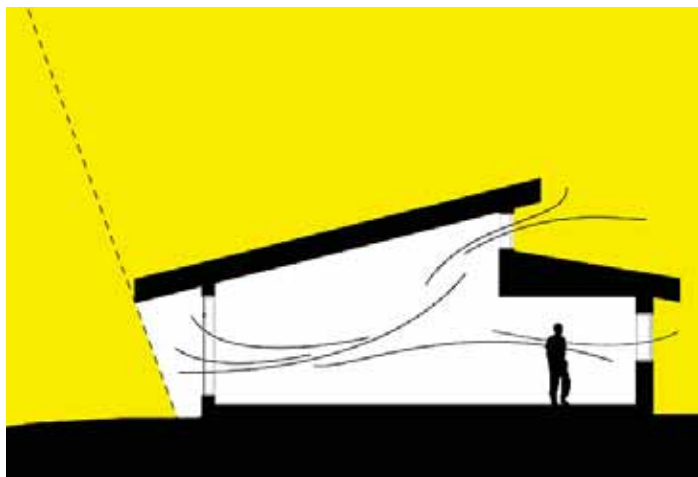
We only work in 3D. Our fees are comparable to any small architecture firm however the proportion of billing per phase might differ.

For example we put a lot more time into the Design Development Phase than Construction Documents. In DD a significant amount of effort goes into making final design decisions and modeling. Ideally, by the time CD rolls around we are simply putting the finishes touches on the drawing package.

FOCUS ON REVIT'S STRENGTHS: SUSTAINABLE DESIGN

It is possible to make your model and families fully parametric and automate many tasks. The key is to know when to implement these and when to leave these alone. It is important to harness Revit's strengths, especially when starting out then move on to more advanced topics. When it comes to sustainable design many think that this is expensive or beyond their reach of knowledge. But this is a good example how any designer can use the out of the box tools in Revit® to create some very valuable sustainable design discussions.

Solares uses passive solar design, so Revit's shadow study feature is especially important for their projects. Passive solar design involves placing main rooms and spaces on the south axis of the house, allowing low-angle winter sun to enter large windows thereby heating the rooms for free. Shading devices placed over these south-facing windows must be provided to block the high-angle summer sun thereby keeping the house cool in the summer months.



The firm performs precise shadow studies on their proposed designs so that they can size roof overhangs and shading devices accurately. While the science of passive solar design is not particularly complex, accuracy is important, otherwise the energy performance of the house may suffer. With Revit® they can be confident that the passive solar design strategies work prior to construction.

Solares Design Build's Co-owner Christine Lolley provides some insight into The Country Trail House, designed using Revit®:

"We wanted the design of the County Trail House to be very modern and minimal. The house has a very unique section: the main roof slopes up from the south façade to create a 15' ceiling along the main corridor of the house. The north roof is offset from this roof, creating a line of high-level clerestory windows on the north face of the building. These windows light the main corridor as well as providing passive ven-

tilation. Because the house doesn't have a mechanical air-conditioning system, these high-level windows play an important role in keeping the house cool in the summer. We wanted this high ceiling to be impressive without being over-bearing. Using Revit® we were able to model the main corridor, roof line and high-level windows so that we could evaluate the effectiveness and proportion of the space.

It's amazing to stand at the front door of the completed house and compare it to the image of the model we built. We aren't the best renderers out there, but the 3D visualization of the space is very accurate!"



Once you start to master these basic principles in Revit® you will want to take on even more challenges. Solares is doing this with their most recent project, Black Bank Hill. Situated on one of the highest points in rural southern Ontario, this home is designed to the Passive House standard(see box). With electric in-floor heating, superior insulation, and the use of thermal mass within the building envelope, the house is projected to have a heating bill of only \$250 per year.

What is a Passive House and what are its challenges?

A Passive House is a certified house or building that follows the strict standards as laid out by the Passive House Institutes of Germany and the US. In general a Passive House uses 90% less energy than a typical home or building. Passive House designers accomplish this by creating super insulated (sometimes insulation levels are as high as R-100 in roof and wall assemblies) and air-tight building envelopes. The result of this additional effort means that mechanical systems are tiny to non-existent depending on the climate. The challenge we face as sustainable designers in Canada as we adopt the Passive House is, of course, the climate. The standards for Passive House are the same whether your building is located in California or Sudbury so we have our work cut out for us!



How can Revit® assist in the Passive House design?

Revit works well with the Passive House energy modeling software PPHP (passive house planning package) because it provides a lot of information that the PPHP needs: wall and glass areas, room volumes and most importantly solar orientation at the different faces of the building.

CONCLUSION

As we have seen in this article, our clients love being integrated into the BIM process. There is no need to put off sustainable design practices. By making use of Revit's powerful visualization



PASSIVE HOUSE LINKS

Passiv Haus
<http://www.passiv.de/>

Passive House US
<http://www.passivehouse.us/passiveHouse/PHIUSHome.html>

Passive Buildings Canada
<http://www.passivebuildings.ca/>

Black Bank Hill Project
<http://www.solares.ca/BlackBank.php?p=Construction>

tools we can facilitate communication quickly and effectively. Our clients respond to this and share our desire to use sustainable design practices. Managing expectations can be tricky but as long as we focus on Revit's strengths we can make our way through the Revit® residential jungle.

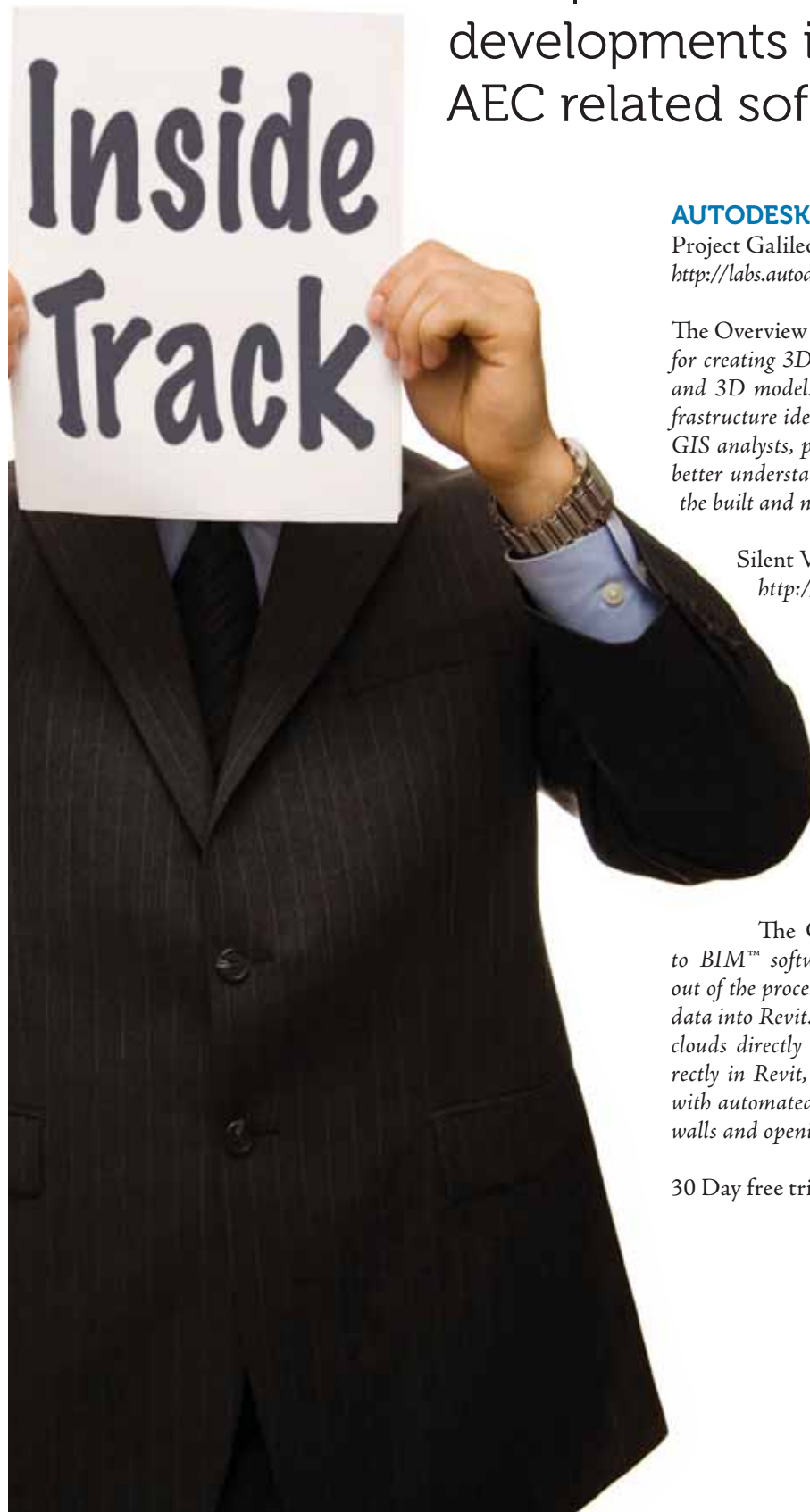
Jay has twelve years of national and international design and drafting industry experience. He is a Leadership in Energy and Environmental Design Accredited Professional (LEED AP), as well as an Autodesk Revit Certified Implementation Expert. In addition to these accreditations, Jay has managed a wide variety of technology implementation projects. He is also the founder and moderator of the Ontario Revit Users Group (ORUG). A highly respected Trainer, Jay has taught over six-hundred students with much positive feedback.



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AUGI | AEC EDGE brings you recent developments in Autodesk and AEC related software items



AUTODESK LABS: PROJECT GALILEO

Project Galileo at Autodesk Labs URL:

<http://labs.autodesk.com/utilities/galileo/>

The Overview reads: "Project Galileo is an easy-to-use planning tool for creating 3D city models from civil, geospatial and building data, and 3D models. Galileo also enables users to sketch conceptual infrastructure ideas within the 3D city model. Using Galileo, planners, GIS analysts, project managers, and architects can help stakeholders better understand infrastructure projects and plans in the context of the built and natural environment."

Silent Video on YouTube:

<http://www.youtube.com/watch?v=qxQuU4G2mn4>

IMAGINiT TECHNOLOGIES: SCAN TO BIM

Scan to BIM at IMAGINiT Technologies URL:

<http://imaginit.rand.com/software-solutions/building-architecture/scan-to-bim>

The Overview reads: "The Scan to BIM™ software add-on takes the ordeal out of the process of getting 3D laser scanning data into Revit. It enables you to import point clouds directly into Revit, visualize them directly in Revit, and interact directly in Revit with automated recognition and placement of walls and openings, as well as pipes and ducts."



Figure 1 - Scan to BIM

30 Day free trial available

POINTTOOLS: PLUG-IN FOR GOOGLE SKETCHUP

pointtools URL:

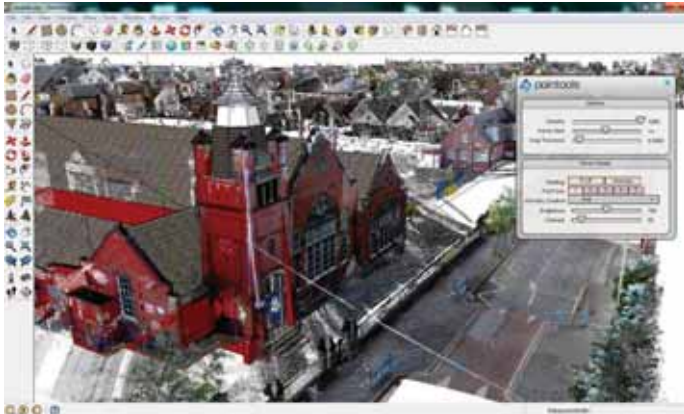
<http://pointtools.wordpress.com/>

Figure 2 - Point Clouds to SketchUP

The Overview reads: “The Pointtools Plug-in for SketchUp extends Pointtools’ leadership as an enabler for reusing the largest point cloud models inside the broadest range of applications. Croser continued, “Through our Vortex platform and widely-used software plug-ins, thousands of Autodesk, Bentley, and Rhino users have been able to benefit from streamlined point cloud model reuse across different applications by eliminating time-wasting translations. Now, the Pointtools Plug-in for SketchUp, enables the same users to increase their return on investment (ROI) from 3D laser scan data by also reusing the same point cloud models inside SketchUp.”

Silent Demo Video on YouTube:

<http://www.youtube.com/watch?v=wLB-oWoK1Xs>**IDEATE SOLUTIONS: BIMLINK**

Ideate Solutions URL:

<http://ideatesolutions.blogspot.com/>

Figure 2 - Point Clouds to SketchUP

Overview: “Ideate BIMLink is a tool that works with Revit® Extension so that you can pull data from a Revit file into user-friendly Microsoft Excel and push Excel data into Revit with equal ease. Ideate BIMLink gives you the power to quickly and accurately name, calculate, manage and manipulate the volumes of precise and consequential data you use in Building Information Modeling and Building Lifecycle Management”

IDEATE SOLUTIONS: EXPLORER FOR REVIT

Ideate Solutions URL:

<http://ideatesolutions.blogspot.com/>

Overview: “10,000-plus elements were never so manageable...The Ideate Explorer for Revit tool gives you an easy, intuitive and profound way to search, quantify and select elements in a Revit model.

When having the ability to search, filter and tie up inter-relationships between 10,000+ building elements can make or break your workday, you need one simple, powerful Revit add-on to help you explore, quantify and manage your Revit building information model.”

Until next issue!

If you’d have some news to share with us for future issues please let us know. Likewise if you are a user of a featured product or news item and would like to write a review, we want to know.

Erik Lewis became involved with BIM after going back to school to make a career change from residential construction. He gained in-depth knowledge of various BIM authoring tools while working as an Application Specialist for an Autodesk retailer. Erik is currently a BIM Coordinator with Cogdell Spencer ERDMAN, where he is deeply involved with the pervasive process change that comes when implementing BIM in an integrated Design-Build firm. Erik spends his free with his daughters and wife and occasionally posts an interesting tidbit to his blog www.whosafraidofthebigbadbim.blogspot.com. You can contact him at erikmlewis@gmail.com.



PLACING STRUCTURAL BEAMS THAT SUPPORT COMPLEX ROOF SURFACES



INTRO

This article will discuss how to model structural steel wide flange beams supporting complex roof surfaces. The first half of this article describes how to model structural beams that curve and undulate in one direction using the structural beam family.

The second half is for the adventurous types and describes how to model beams that curve in two directions, like a corkscrew or a roller-coaster rail using the new in-place mass editing tools. One single complex roof surface will be used to as an example to illustrate this process.

Although this article is limited to one single example of a complex roof surface and steel wide flange beams there is enough information presented so that these basic techniques could be applied to all types structural framing and all types of surfaces.

COMPLEX ROOF SURFACES... ARE YOU KIDDING?

Let us consider the following roof surface shown in Figure 1. This surface is an in-place mass that consists of four planar reference lines. The spline by points command was used to create the reference line and the surface was created by creating a form over those reference lines. This surface was built to represent an extreme example of complex roof geometry. Keep in mind that this surface is fictitious, not developable, and is curved in two directions. Hopefully, this is nothing that you would ever encounter in your projects. The techniques discussed in this article should be a valuable addition to your toolbox and give you the confidence to tackle any complex surface that anyone could throw at you in the future.

Note: The following procedure described in this article could be applied to any surface, whether the surface was built using the in-place massing tools in Revit or built in 3DMax, AutoCAD or any other 3D modeling software and imported into the Revit project as an .sat or dwg file.

Note: Profile lines, reference lines, wire frames and analytical lines are just other names for "work lines" of beams. They are analogous to work points except they are in two-dimensions. Work lines define where the beam is located in 3D space and represents how a beam is defined based on its cross section. For the purpose of this article all work lines are located at the top center of the beams as shown in Figure 2.

CREATING THAT BEAM LOCATION

When modeling beams you have to do two things. First you have to find where to place the workline of the beam and second you have to be able to "pick" the workline to place the beam in Revit.

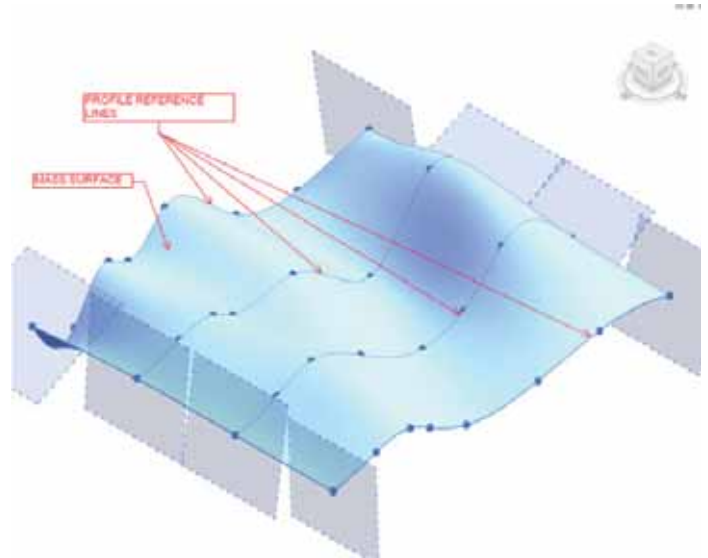


Figure 1 - Complex Roof Surface

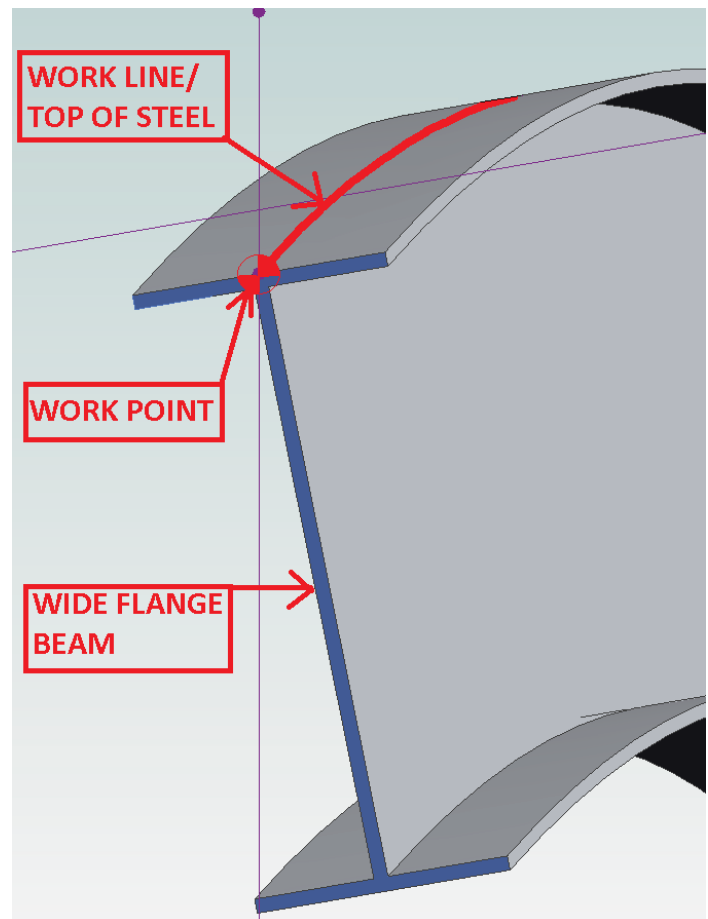


Figure 2 - Beam Work Lines

FINDING THE INTERSECTION OF TWO SURFACES

Every single beam's workline is always located at the intersection of two surfaces. The intersection of two surfaces results in a line just as the intersection of two lines result in a point. Let us now consider some simple horizontal beam framing to illustrate this point. Every beam's top of steel is located at the intersection of the bottom of the roof deck surface and the Y-Z plane that is formed from the gridline the beam is located on and the Z axis as shown in Figure 3.

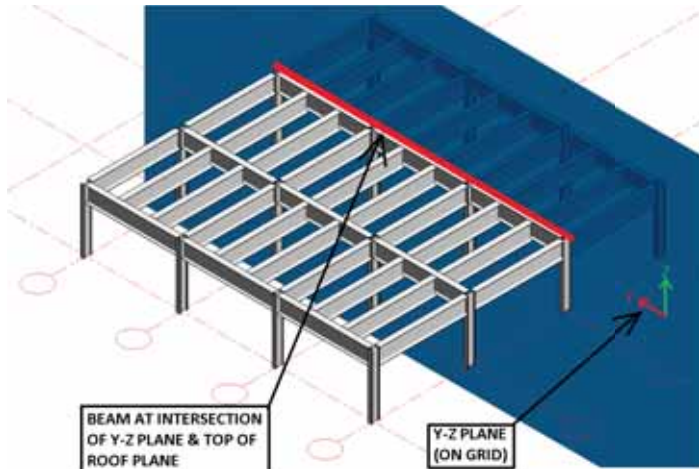


Figure 3 - Horizontal Beam Framing at Intersection of Roof and Y-Z Plane

In this case, the beam location is obvious and there is no need to know the single line resultant of two intersecting surfaces to find its location. However, when the roof surface is complex finding the beam's location is not so obvious and it becomes necessary to locate the by finding the intersection of surfaces.

"PICKING" THE INTERSECTION OF TWO SURFACES

There are two methods for placing structural beams onto complex surfaces in Revit. The first method is by using the "draw" command within the beam command. This first method is not very accurate because when you "draw" beams on a complex surface you have to guess where the beam's entire workline is located.

The second method for placing beams is by using the "pick" command within the beam command. This method allows you to place a beam on a specific line and is the most accurate way of modeling beams on complex geometry.

As described above, you must be able to "pick" a line in order to place a beam correctly. I am sorry to say that many lines in Revit cannot simply be "picked" to place beams. Also, picking the intersection of two surfaces has to be done in a roundabout way because a line cannot be "picked" between two surfaces unless the two surfaces are joined. Unlike 3DS Max, Revit has no simple command that allows you to "find" or "pick" the intersection of two surfaces. Also Revit does not allow two surface elements to be joined together. Only solid elements can be joined together as illustrated in Figure 4. If you want to pick the intersection between two surface elements you have to first host solid "guide entities" onto these sur-

faces, such as walls or solid mass elements, join the solid elements together and then "pick" the intersection line.

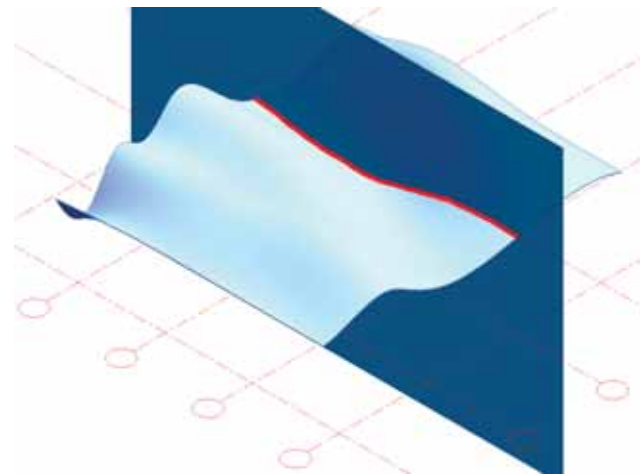


Figure 4 - Resultant Intersection Line of a Complex and Planar Surface

NOTE: The sole purpose of modeling reference planes, reference lines, and reference points is to use them as "guides" to model other Revit elements such as gridlines, walls, etc. However, there is nothing preventing you from using Revit elements such as walls and slabs as "guide entities" either. In fact, using walls and slabs as "guide entities" and discarding them later is sometimes the only way to model complex elements as described below.

PLACING PLANAR BEAMS (USE STRUCTURAL BEAMS)

99.999% of the time, you will only ever need to place curved beams curving in one direction, in other words, curved in only one plane meaning the web of the beam remains plainer. The following method below and illustrated in Figure 5 describes how to place these types of beams using the standard structural beam > pick command. Beams curved in two directions will be covered in the next segment and will need to be placed using in-place masses.

1. Host a wall...yes a wall...onto the roof surface that is the same thickness as your roof slab and hide the host surface. The wall is used as a "guide entity" as described earlier.
2. Determine what plane the curved beam will be located and place a vertical wall whose face lines up with the plane of the curved beam. The wall is used as a "guide entity" as described earlier.
3. Join the vertical wall to the roof using the "join" command. Note that when the wall and the roof are joined then the wall "cuts" out a portion of the roof as shown in Figure 5.
4. Repeat steps 2 and 3 by placing vertical walls at all beam locations and join those walls to the roof solid. The final roof surface should look similar to Figure 6

Structure

- Before a beam is placed the work plane has to be defined. Simply set the work plane to the face of the wall solid as defined in step 2.
- To place the beam, activate the beam > “pick” command and pick the intersection of the vertical wall and the roof surface as shown in Figure 5.
- Repeat steps 5 and 6 until all the beams are placed. The final roof framing should look similar to Figure 7.
- At this point you could also add columns and attached them to the beam girders. Why not the roof surface. If you remember the roof surface is a wall hosted on a mass surface and Revit does not allow you to attached columns to wall elements.

Also I have noticed that if the roof surface is too complex sometimes a structural beam family cannot be created when using the pick command. In these rare cases use an in-place beam family as described in the next section.

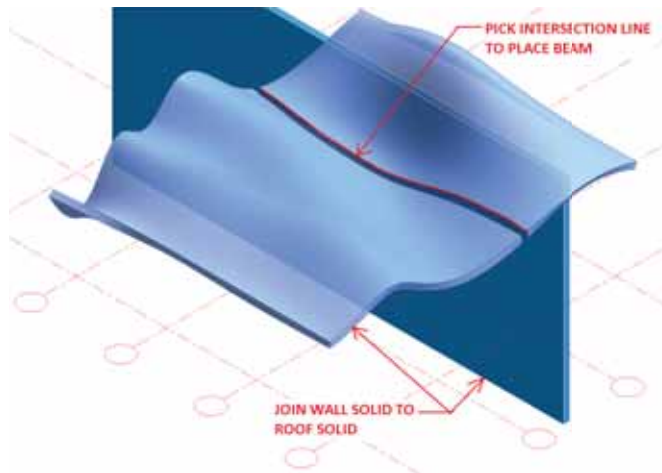


Figure 5 - Joining Walls and Roof Solids, and Picking the Beam Location

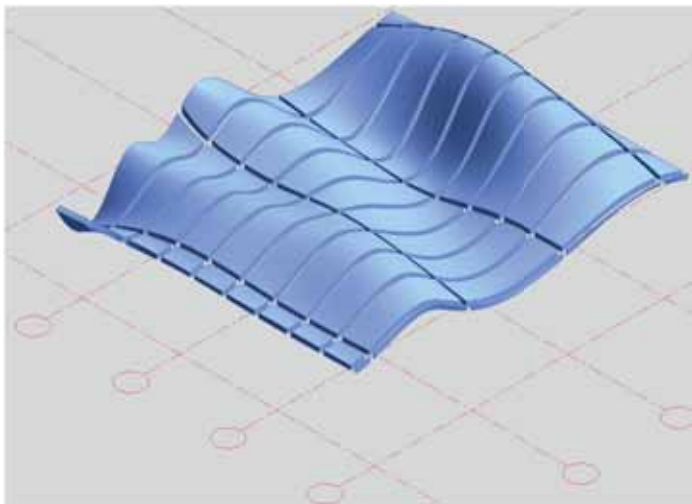


Figure 6 - Roof Solid with All Wall joints Before Beams are Placed

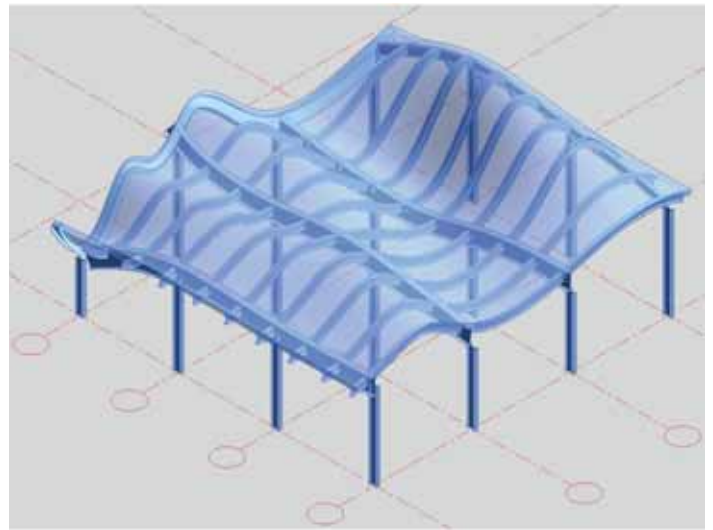


Figure 7 - 3D-View of Final Beam Framing

PLACING BEAMS THAT CURVE IN TWO DIRECTIONS (USE IN_PLACE MASSES)

To create a beam that curves in two directions you will need to use an in-place mass because the Revit structural beam family can only curve in one direction. The furthest edge of the roof surface from the view in Figure 1 is not planar; therefore if we want to place a beam at that edge then it will need to curve in two directions. To build an in-place mass of a wide flange beam you have to build an extrusion line or workline as shown in Figure 9 and then build a profile family of the wide flange cross section as shown in Figure 8.

IN-PLACE MASS PROFILE (BUILD A MASS FAMILY)

To build an in-place mass of a wide flange beam you have to build a beam mass profile. Revit does not simply allow you to assign a beam profile to the in-place mass. A profile of the wide flange beam has to be built in the mass family editor and then nested into the in-place mass, then extruded along an extrusion line. To do this, start a new conceptual mass family and in the plan view create a beam profile using only lines. Add parameters to these lines and create different family types for as many wide flange beam types as you like. See Figure 8.

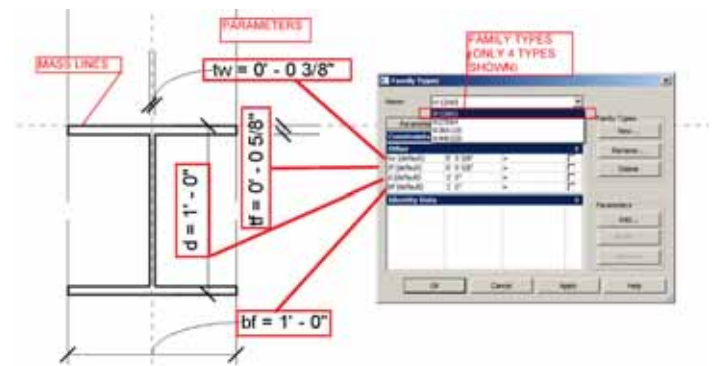


Figure 8 - Mass Beam Profile Family

PLACING THE PROFILE ON THE EXTRUSION LINE

Now that the beam mass profile family is created, it's time to create the in-place mass beam.

The following steps show how to place a beam workline on a curved surface that curves in two directions.

1. Activate the "in-place mass" command and click on the reference point tool. Place reference points on the roof edge and make a spline thru those points as shown in Figure 9. Note that the more points you add the more accurate the spline will approximate the true geometry of the roof edge.
2. Host the mass beam profile shown in Figure 8 onto the reference spline's end point and create form.
3. The final beam should look like Figure 10.
4. Now flex the different family types and you will see the beam size change instantly as shown in Figure 10. Pretty cool!

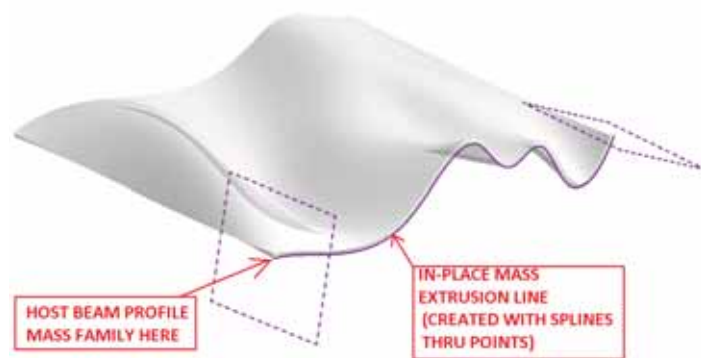


Figure 9 - The Mass Extrusion Line

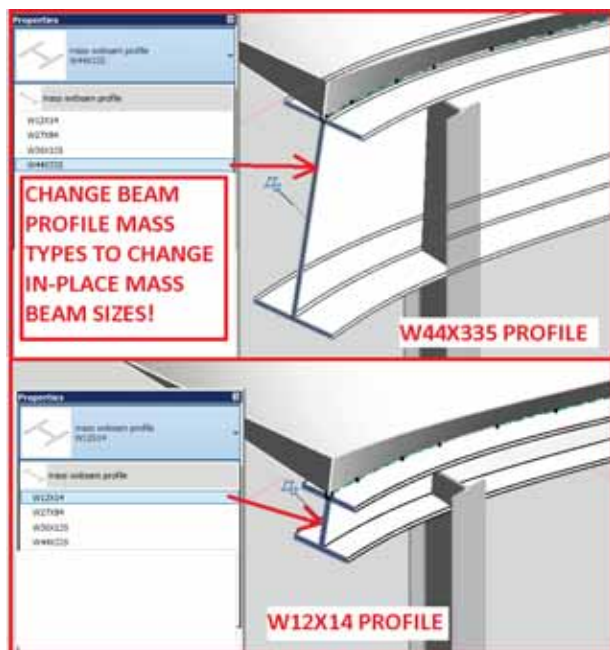


Figure 10 - Flexing the Different Beam Profiles In-Place Mass Family Beam

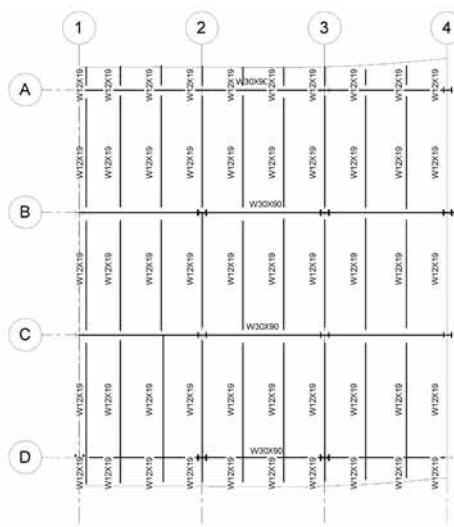


Figure 11 -Roof Framing Plan

Note: In-place mass families are very limited because they are essentially only good for 3D modeling. They do not have any analytical lines, they do not schedule easily and they do not show up correctly in plan views. See the next section on how to correct this last issue. I would recommend that you only use in-place

masses as beams if the use of a structural beam family is not possible due to the complexity of the geometry.

DOCUMENTING IN-PLACE MASS BEAM GEOMETRY IN PLAN VIEW

I have learned from experience, on production jobs with complex geometry, not to assume all the geometry that was built in the 3D model would just magically appear correct in the plan documentation views. It is always a good idea before any deadline to set aside time to correctly document the 3D model in the 2D plans and sections if necessary. The good thing about using structural beam families is that they show up correctly in plan with very little effort. The only corrections that need to be made, described below, are the in-place beam mass families.

In-Place beam mass families do not show a symbolic line in plan course view as do structural beam family elements. Therefore the following steps need to be taken to show in place steel beam families correctly in plan.

- Go to the roof plan and use the detail pick line command and select the extrusion line of the in-plane mass family shown in Figure 9.
- Edit the in place mass family element and open the properties window and select the visibility graphics overrides. Select only fine and medium. This will allow the in place family extruded view to only show in the medium and fine detail views. The final roof plan should like Figure 11.

CONCLUSION

Hopefully after reading this article you are able to take away some tips on how to model beams that support complex roof geometry. You should have the basics to tackle any complex roof that you encounter in the future.

HEAD'S UP!

Updates, Service Packs and Top Known Issues (obtained from product pages at Autodesk.com)

AUTOCAD/ACA/AMEP TOP KNOWLEDGE BASE ISSUES

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Support for AutoCAD and AutoCAD LT on Apple computers

<http://usa.autodesk.com/adsk/servlet/ps/dl/item?siteID=123112&id=9602818&linkID=9240617>

Ability to chose between available and selected Standard in AutoCAD Mechanical 2010

<http://usa.autodesk.com/adsk/servlet/ps/dl/item?siteID=123112&id=14054809&linkID=9240897>

How to detect and remove the Acad.vix virus

<http://usa.autodesk.com/adsk/servlet/ps/dl/item?siteID=123112&id=13717811&linkID=9240617>

Enabling 3GB switch on Windows Vista or Windows 7

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Erik Lewis became involved with BIM after going back to school to make a career change from residential construction. He gained in-depth knowledge of various BIM authoring tools while working as an Application Specialist for an Autodesk retailer. Erik is currently a BIM Coordinator with Cogdell Spencer ERDMAN, where he is deeply involved with the pervasive process change that comes when implementing BIM in an integrated Design-Build firm. Erik spends his free with his daughters and wife and occasionally posts an interesting tidbit to his blog www.whosafraidofthebigbadbim.blogspot.com. You can contact him at ikmlewis@gmail.com.



Revit MEP Templates

As many design firms contemplate the switch to Revit they quickly realize the importance of having a well-developed template in place. Ideally, this template would be setup and used as the basis for staff training just prior to the first project. This can be a challenging task if nobody in the firm has any Revit experience; in which case the services of an experienced consultant should be used to help develop the template and provide training. In any case, this article is meant to help the MEP design firm begin to understand what is meant by a “well-developed” template – whether it is being done in-house or by a consultant.

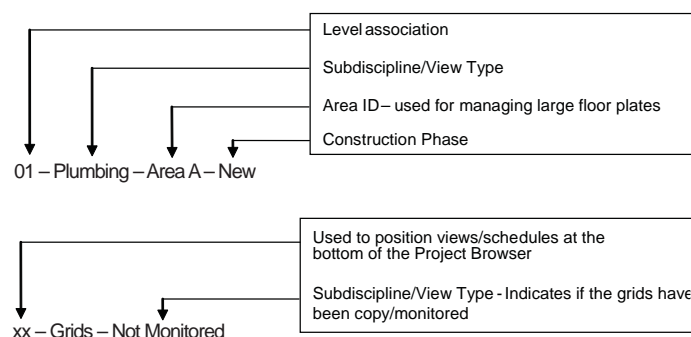
The development of this article represents a portion of material which will be presented in Las Vegas, at Autodesk University (AU) 2010, by Mr. Hristov and assisted by Mr. Stine. The information presented at AU will be much more detailed and expounded upon!

PROJECT BROWSER ORGANIZATION

The Project Browser's (PB) views are one of the most important aspects of the Revit template. Because of that I would like to go into detail and give you some best practices on managing views in the template and in a project environment.

First, develop naming conventions for the different type of views. Here is an example of my favorite naming conventions:

Plan Views:



The Area ID and the Construction Phase are used only when needed. Some companies like to setup a template for New Construction projects and another one for renovation projects. This can be avoided by creating all views in the same template and de-

leting the views that are not necessary (refer to Figure 3 how to delete extra views).

SPLASH VIEW

The splash view is a Drafting View that can be used to communicate project related information. It can contain information like project deadlines and team member tasks. The splash view is very light and easy to load, because it contains only text and lines. When users are Synchronizing with Central they should be in the splash view. This way, when they open the project the splash view will be the first view to open.

TIP: Create fresh local file each day!

LEVELS, PLAN VIEWS AND SCOPE BOXES

Create 5 to 10 Levels based on your typical building type. Once the Levels are created create all necessary subdiscipline plan views – Fire Protection, Fuel, HVAC, Hydronics, Medical Gas, Plumbing, Site, Terminal Unit Zoning, Lighting, Power, Systems, etc.

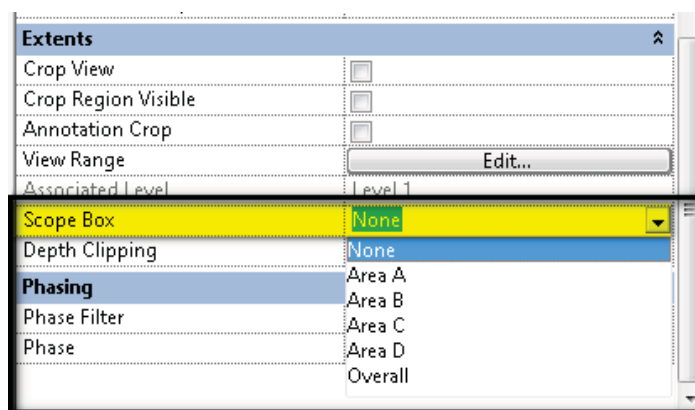


Figure 1 - Associating the Scope Boxes with the views

Once all necessary plan views and area views (i.e. dependent views) are created you would need to associate them with the Scope Boxes. This is done via the Scope Box parameter in the View Properties.

Step 1: Create four dependent views for each view. These dependent views would be used for projects that have large floor plates that can't be placed on sheets at a given scale

Step 2: Create a floor plan and a 3D view called Scope Boxes and 3D Scope Boxes – these views will be the only views in the entire project that will display the scope boxes.

Step 3: Create a Scope Box per area (make sure to name the scope boxes appropriately from the property palette) - Area A, Area B, Area C, Area D

Step 4: Create one more scope box for overall floor plans (refer to Figure 1)

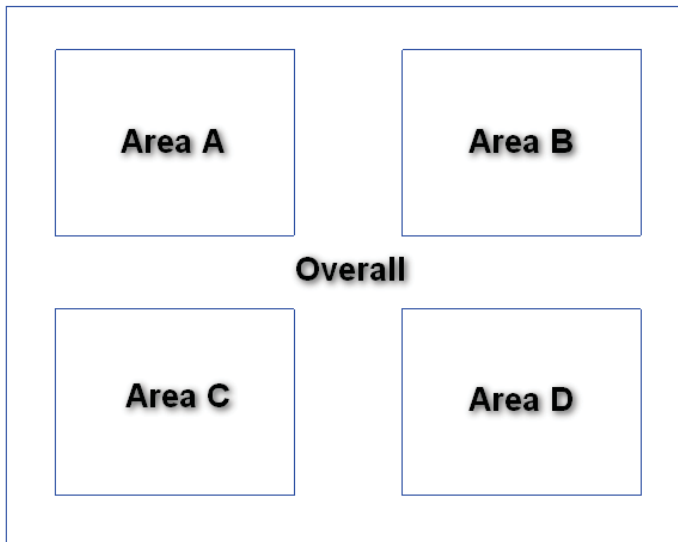


Figure 2 - Scope Boxes arrangement in the template

Step 5: Associate all views with the corresponding Scope Box (from the Properties)

TIP: Removing unnecessary Area views – create 4 schedules with a “Filter by”: set to View Name Contains “Area A” to sort out and delete “Area A” views, “Area B” to delete Area B views, etc. when areas are not needed for projects. This will need to be duplicated for existing and demolition views as well!

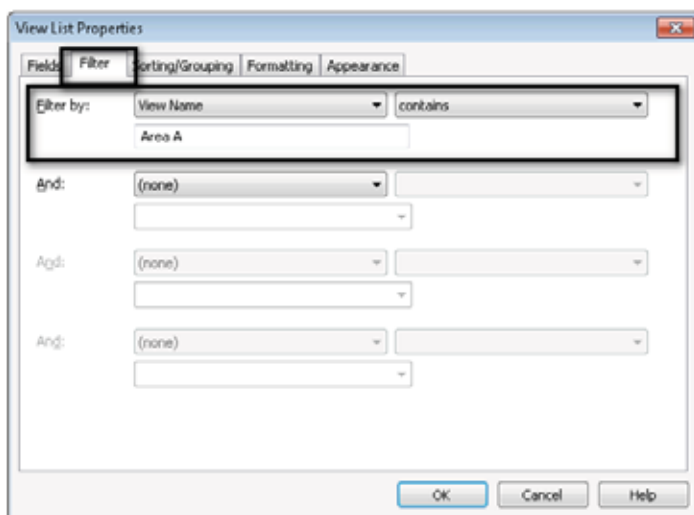


Figure 3 - Schedule filter for isolating and deleting area view

TIP: Create one set of *DependentViews* and then use the “apply dependent views” to all other plan views!

SORTING AND FILTERING THE PB

To organize and group the views in the Project Browser I use two Project Parameters – View Group and View Type. The Default Systems.rte template that comes with Revit uses “Discipline” and “Subdiscipline” to organize the PB. I find some limitations with this method. Example: Drafting Views placed under Mechanical discipline show DWGs and detail lines grayed out (this was fixed in Revit MEP 2010). Also, the inability to create additional names for the top level parameter (Discipline). Because of those and other reasons I prefer to use my own parameters.

If your company doesn’t like the idea of Plot and Work views you can skip this part!

Step 1: Create two Project Parameters – View Group and View Type. These two parameters should be grouped under Graphics and applied to Viewscategories.

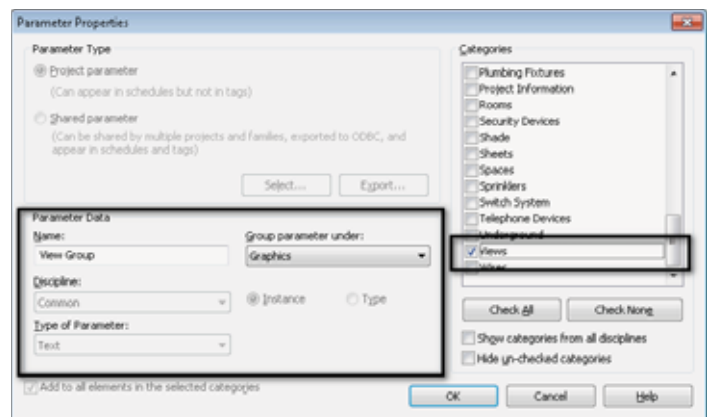


Figure 4 - View Group and View Type Project Parameters settings

Step 2: Fill out the necessary data for all views. Refer to Figure 4 and Figure 5 for an example.



Figure 5 - Sample Project Browser organization

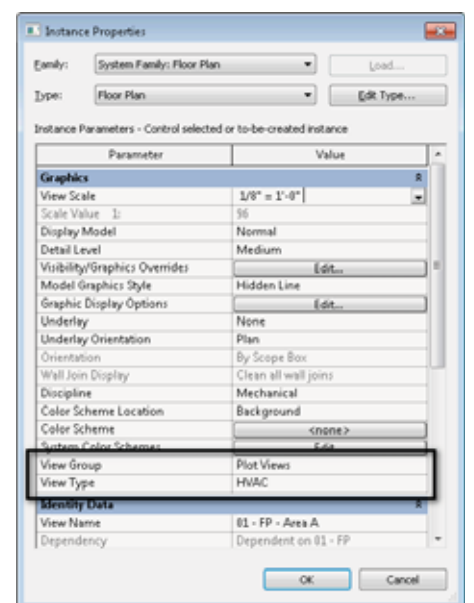


Figure 6 -View Group and View Type parameters

The parameter View Group is used to group the views by Plot, Work, and xx Coordination. All views under Plot are the documentation views and they will be placed on sheets. The Work views are views without any annotation objects, set to wireframe with spaces and zones turned off. Those views are going to be much faster to draw, select geometry and navigate around. Under the xx Coordination you can put views that are used to coordinate major elements between the MEP and Arch models – grids, levels, scope boxes, match lines, etc.

LEGENDS

As many of you know, Legends are very special views Revit. They can be placed on multiple sheets, whereas all other views can only be placed on one sheet. Because of that ability they are perfect for General Notes (GN) and Keynotes (KN). I have seen that different companies do this differently. Some companies would have the General Notes and the Keynotes per sheet and others would have the General Notes per project (or subdiscipline) and the Keynotes per view. If the General Notes are per project you must create them as Legends. For the Keynotes, however, you have a choice to make; You could make the Keynotes as Legends, even though they will not be placed on multiple sheets, or you could make them as Drafting views. The benefit of making them as Drafting views is that you could transfer them from project to project if needed. The benefit of having them as Legends is keeping General Notes and Keynotes together. So, I will leave it up to you to decide, which benefit outweighs the other one.

Here is a sample naming convention for Legends:

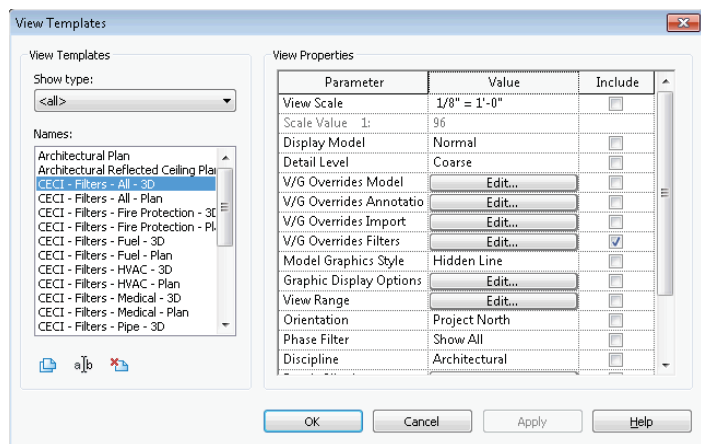
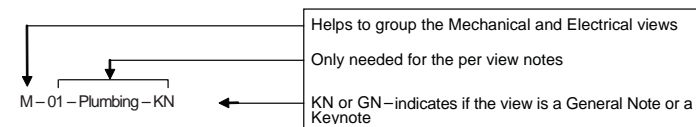


Figure 7 - View Templates for Filters

VIEW TEMPLATES

Once you are done creating all the necessary views you will realize that trying to manage them all, is not going to be an easy task. Thanks to View Templates this task is much easier. View Templates allow you to capture settings from one view and apply them to another. Besides making things easier, View Templates will also ensure a consistent look of all your projects across the company. I would recommend

creating View Templates for each subdiscipline. If you are using Plot and Work views then you should have a View Template for each of them. Example: HVAC – Plan – Plot, HVAC – Plan – Work.

TIP: Select multiple views in the PB and right click to apply a View Template to all selected views at once!

FILTERS

One key element of View Templates is Filters. In Revit MEP we use Filters to display the different Pipe and DuctSystems with their appropriate Color, Linetype, and Lineweight. In fact, Filters are the only way to differentiate the display of the different pipes and ducts systems. There are different rules and preferences used to create Filters. I will show you what I believe is the most reasonable way, based on my experience. And believe me; I went through my fair share of trial and error, as I haven't seen any good documentation about this process out there.

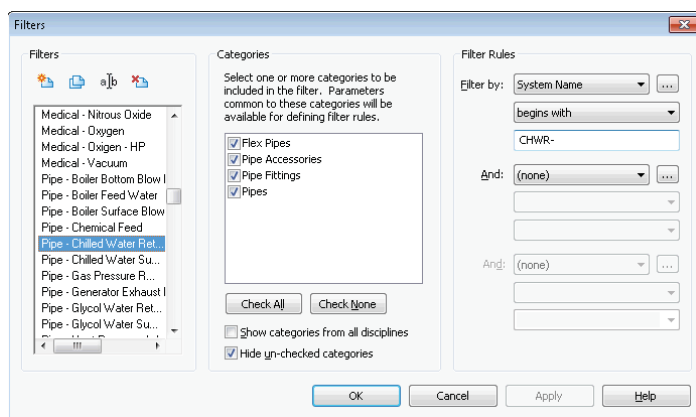


Figure 8 - Creating Filters

FILTER NAME/PIPE TYPE	TAG	SYSTEM NAME	TAG	LINETYPE	COLORS				Color Search
					AutoCAD Color #	RGB	HEX	HEX	
FF - Combination Standpipe	ESP	ESP	ESP	SOLID	120	127	0	0	
FF - Dry Pre-Action	DPA	DPA	DPA	SOLID	142	0	153	0	
FF - Dry Sprinkler	DSPR	DSPR	DSPR	SOLID	84	0	153	0	
FF - Dry Standpipe	DSP	DSP	DSP	SOLID	120	0	255	0	
FF - FM 200	FPM	FPA	FPM	SOLID	133	102	255	0	
FF - Standpipe	SP	SP	SP	SOLID	202	153	0	0	
FF - Water Supply	WSP	WSP	WSP	SOLID	3	0	0	255	
FF - Wet Pre-Action	WPA	WPA	WPA	SOLID	84	0	153	0	
FF - Wet Sprinkler	WSPR	WSPR	WSPR	SOLID	142	0	153	0	
FF - Wet Standpipe	WSP	WSP	WSP	SOLID	142	0	153	0	

Figure 9 - Sample Excel table, organizing the various pipe systems (filters)

Step 1: Develop a complete list of all possible systems that your company would ever need. Refer to Figure 6 for a small sample portion of the complete list; It is important that you organize this in Excel ahead of time, as Revit can't sort them appropriately and when you create 150 filters, the only way to find what you want is to have some kind of organization.

Step 2: To create the filters, in Revit open the View tab and click on the Filters command.

Step 3: In the filters dialog box create all of the filters that you have previously developed in Excel. I have found that the following rules seems to work the best – Apply the Filter to Flex Pipes, Pipe Accessories, Pipe Fittings, Pipes. Set Filter by: to System Name, and the condition to: begins with

TIP: Avoid the following colors – yellow, red (selection – unless changed), cyan, black and white.

TIP: When pipes or ducts are displayed in solid black color, this indicates that they don't belong to a system or they do belong to a system but the System Name is not following the Filter rule!

CONCLUSION

This article just scratches the surface of the many things that need to be setup in the MEP firm's Revit template. The AU class will cover additional MEP topics such as (we hope to see you there):

- ♦ Duct and Pipe Types
- ♦ Annotation Families
- ♦ System Families
- ♦ Electrical and Mechanical specific Settings
- ♦ Default Sheets
- ♦ Shortcuts
- ♦ Printer Setup
- ♦ Project Phasing

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*Daniel John Stine, CSI, CDT is an author, instructor, BIM manager, and architect with nearly 20 years of experience. Working full-time at LHB, a 160-person multidiscipline firm in Minnesota, Daniel provides training and support for all versions of Autodesk® Revit®, AutoCAD® Civil 3D®, and AutoCAD. Dan is a member of the Autodesk Developer Network and an Autodesk Revit Architecture 2010 Certified Professional. He teaches AutoCAD and Revit classes at Lake Superior College. Leveraging his professional experience, Daniel has also written the following textbooks: Design Integration using Revit 2011 (Architecture, Structure and MEP), Commercial Design using Revit Architecture 2011, Residential Design using Revit Architecture 2011, Residential Design using AutoCAD 2011 and Commercial Design using AutoCAD 2011.
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