Issue 5 / 2009

AUGI World

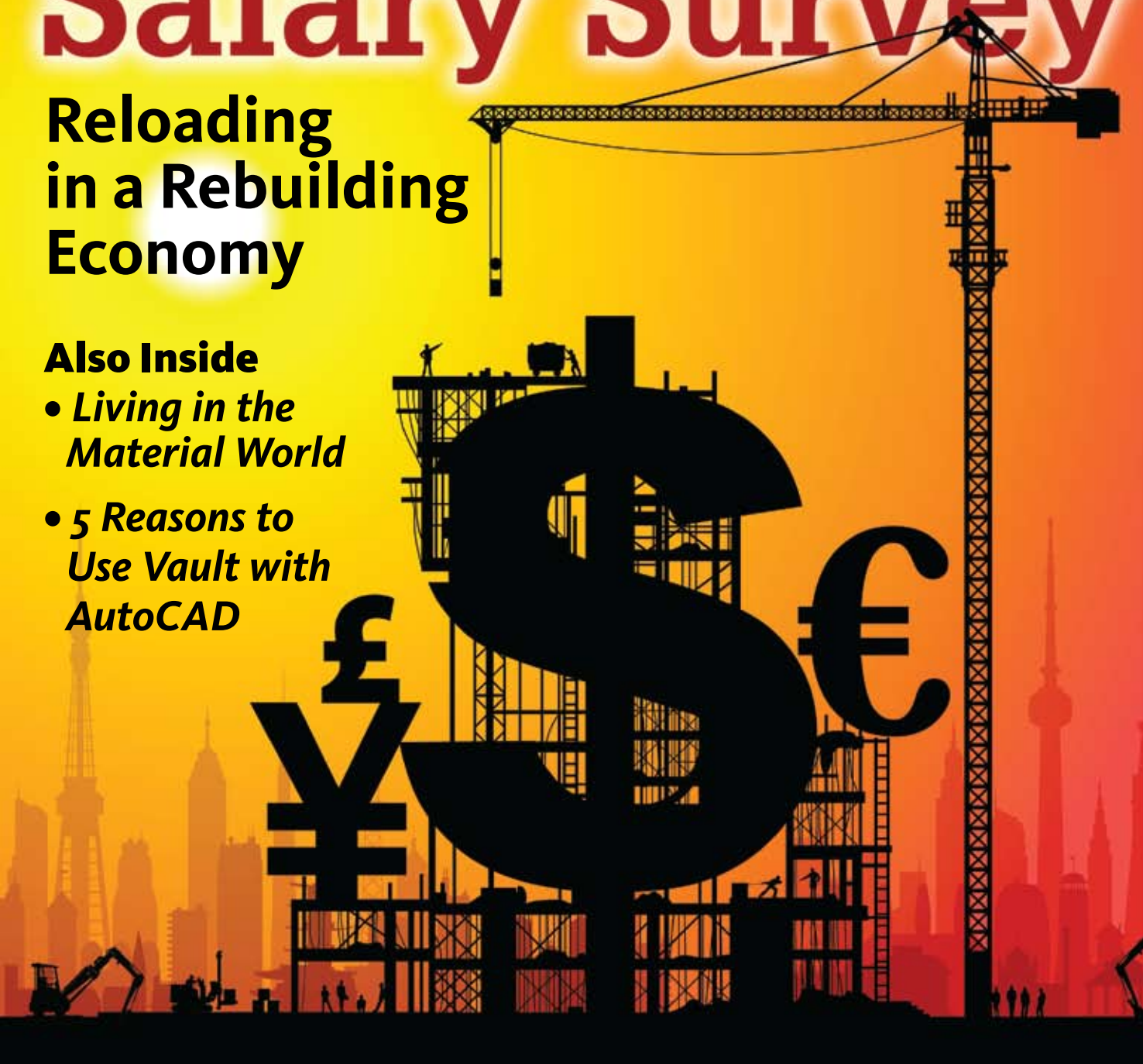
The Official Publication of Autodesk User Group International

8th Annual Salary Survey

Reloading in a Rebuilding Economy

Also Inside

- *Living in the Material World*
- *5 Reasons to Use Vault with AutoCAD*



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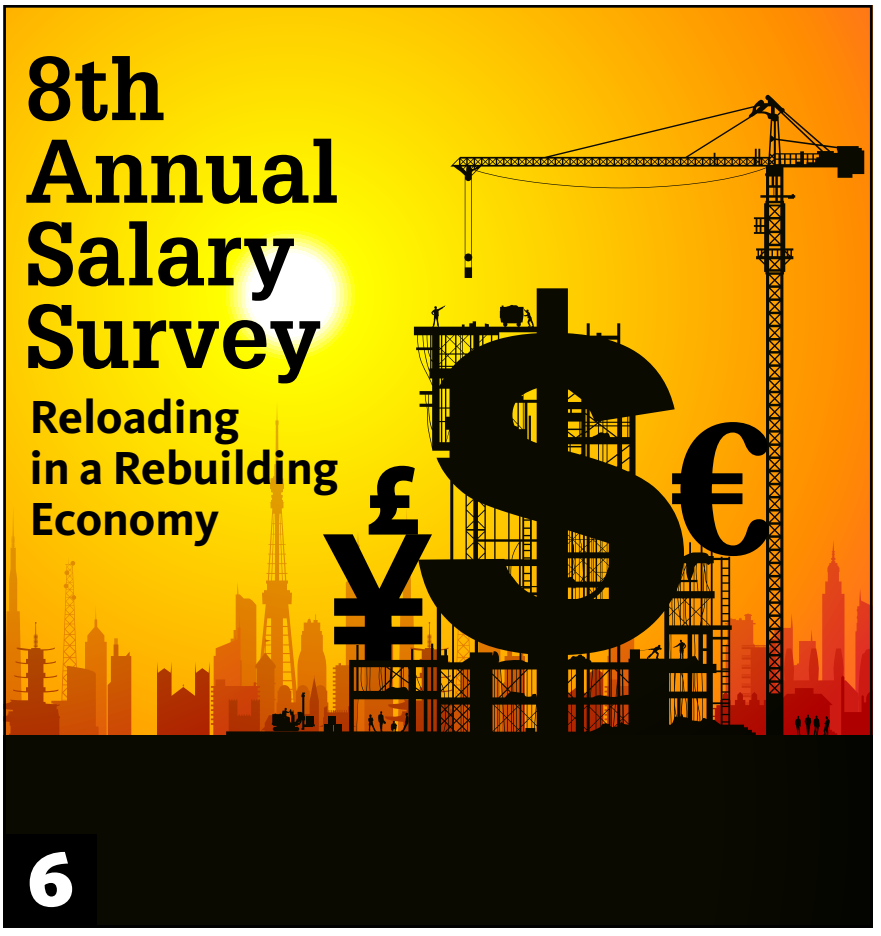

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AUGIWorld

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The CAD Manager

Physician, Heal Thyself

Are you better at your job now than when you were hired?

Unless you can confidently answer this question in the positive, you may have some work to do. Your management is thinking about this question. It is always about what you have done lately. Past history will carry you only so far.

CAD managers are tasked with helping others improve their understanding and value to the firm. They invest so much in making processes work better, improving others' skills with the tools and making them more productive in their work efforts.

But who improves the CAD manager?

You are often on your own. My advice is to make sure that you are getting the necessary training and improving your understanding of the software, processes, and procedures related to CAD. You need to be asking yourself, "Am I better at my job now than I was when the company hired me?"

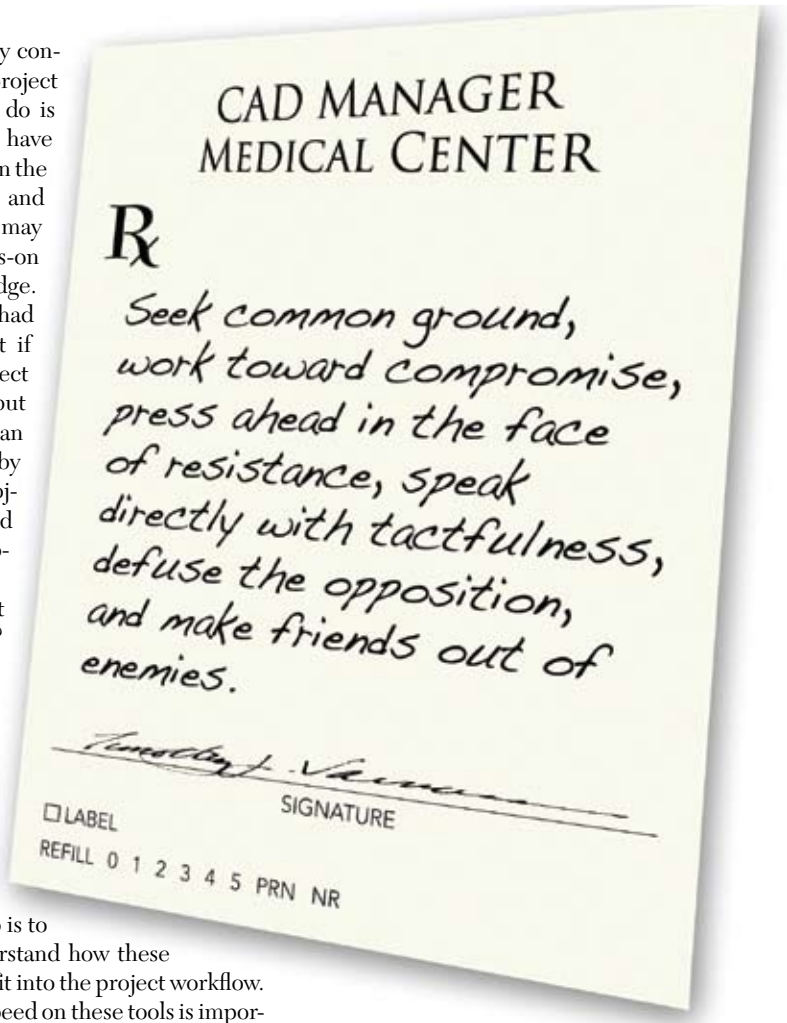
Let's take a look at this question in specific areas.

Software use

Most CAD managers also pull double duty at training, so this area is not a problem for most. CAD managers have to learn the software then train others in its use. You spend time reading the books, testing the tools, and making sure that you understand all the tools' complexities. You train others multiple times so it sinks in deeply. Ultimately, you develop a great grasp on the tools your staff is using.

That being said, one area of software understanding that you may not have is the flow of process on the day-to-day level. You need to stay connected to the project flow. If all you do is train, then you have a great handle on the fundamentals and beyond, but may not have hands-on project knowledge. You may have had this in the past if you were project chargeable, but those skills can be outdated by advances in project delivery and software upgrades.

What about new software? There are a lot of new software offerings that your firm may purchase based on the recommendations or expertise of others. Your job is to learn and understand how these tools work and fit into the project workflow. Getting up to speed on these tools is important and also helps you integrate the tool into the process.



Planning and budgeting

CAD managers should be budgeting software and hardware purchases. Researching what is available, selecting a direction for the firm, and mapping out a plan to get there are part of the job. If you have never done this before you were hired, you may be asked to do so at some point. Planning takes time and intuitive reflection. Knowing your company is critical so that the planning you do aligns with corporate goals and initiatives.

Start with the overall plan of what you and others think is needed. Start moving from the plan to the budget. Add numbers and costs. Keep in mind that it is a bud-

get, not an accounting document. Getting close on the costs is good enough.

Every year you do this you should be getting better. Keeping track from year to year helps you refine the process.

Purchasing

Once you have the budget in place, you will need to start purchasing the items as they are approved. Purchasing is an art. Everyone can pay retail, but you are looking for deals. Negotiating is a skill you need to learn. The more you do it, the better you get. Starting small is okay. See if you can get discounts—ask for them every chance you get. Simple questions such as "Is this the best you can do?" can get you significant discounts. Ask the question and wait for them to reply.

Make them work for your money, especially in this economy. Drive hard bargains. Keep asking for discounts. Don't let them get off easy. Read books on negotiating techniques (I have). The better you get at this, the more valuable you are to your firm.

Saving money

Complementary to purchasing prowess is saving money. You need to be sharp at this skill in the current economy. Saving money differs from getting good discounts and cost breaks. It includes that, but it is different. Saving money calls for you to review your plan and decide what "not" to do. What can be postponed, what can be delayed, what can be forgone? This is not as easy as it may seem. You have to know your environment well to know what you can postpone.

When you do save money, make sure you tell your boss about it. IT usually goes unnoticed.

Management skills

Increasing your management skills takes work. This part of your job is expected from your bosses. They will expect you to know how to best manage the software, hardware, and processes. Managing hardware and software is more of a mechanical process. Tracking licenses, users, quantities, installs, and more is done via Excel on the low point or asset management tools at the high end. Process management is overseeing the flow of work and file management. Pay attention to the processes to see where you can apply automation and software solutions.

People skills

Getting along and helping others communicate are part of your people skills. These should always be advancing. They are so needed in most firms and are so underdeveloped in most people. Communication, negotiation, being an intermediary, and more are the skills you need to navigate the choppy waters of CAD production. Gone are the days when your CAD skills will get you through. You have to have advanced people skills.

Skills like these include the written, the verbal, and the non-verbal. You need to know how to seek common ground, work toward compromise, press ahead in the face of resistance, speak directly with tactfulness, defuse the opposition, and make friends out of enemies. All of these will assist you in expanding your presence within and outside the firm.

There are tons of books on these subjects. Buy one, read it, put it into practice.

So back to the original question…

Are you better at your job now than when you were hired?

Mark W. Kiker is president of the AUGI Board of Directors. He is a National CAD Standards Project Team Member and team member of the National BIM Standard. Mark is general editor of BLAUGI and also publishes caddmanager.com, the CADD Manager's journal, as well as the caddmanager.com blog. He is a returning faculty member at Autodesk University. He is currently chief information officer for HMC Architects in Ontario, California.

8th Annual AUGI Salary Survey

This spring, we asked our user community to volunteer a few minutes of their time so that we could collect information for the annual AUGI Salary Survey. Thank you so much for taking the time to contribute to this resource!

A reminder to those who did not participate in 2009 - the AUGI Salary Survey is an anonymous survey consisting of 18 questions. Data is presented in broad groups and is in no way traceable to you as an individual. The information is used only for this survey and nothing else. So, please, feel secure in participating next year!

Responses (and job security) down

We had fewer than 5,000 participants, which is about a 17% drop from last year. Based on the percentage of respondents, it doesn't look as if any particular region or industry was more affected than any other—the numbers dipped across the board. I really hope that I have some happier news and bigger numbers to report after the next survey.

Here are some statistics that stood out as we compiled this year's survey.

Surprisingly enough, in light of the many layoffs in our industry, Job Satisfaction levels are down less than 2% from the past two years, settling in at 77.5%.

More predictably, Job Security ratings dipped 10 percentage points—from 83% in 2007 and 2008 down to 73% this year.

Overall, the average salary has increased 2% from 2008. Among those who did receive a raise, the average was 5.1%, slightly lower than the 5.9% reported in the previous survey. The overall pay didn't increase nearly that much because a whopping 15% of respondents have taken a pay decrease this year, versus only 3% of members last year.

Get the skinny, online

Would you like to know which fields and job functions pay the most? Which industries have been giving the largest salary increases? Which disciplines have a significant number approaching retirement age? Which jobs you can find more women occupying? Which fields offer the best benefits and return the highest levels of job satisfaction?

Well, if you do, then you'd better head over to the AUGI website at www.AUGI.com, where I'll be putting the remainder of this year's data.

You'll notice that we have only 10 of the 28 disciplines listed here in *AUGIWorld*. These are the fields with the highest levels of respondents and enough replies to provide regional breakdowns.

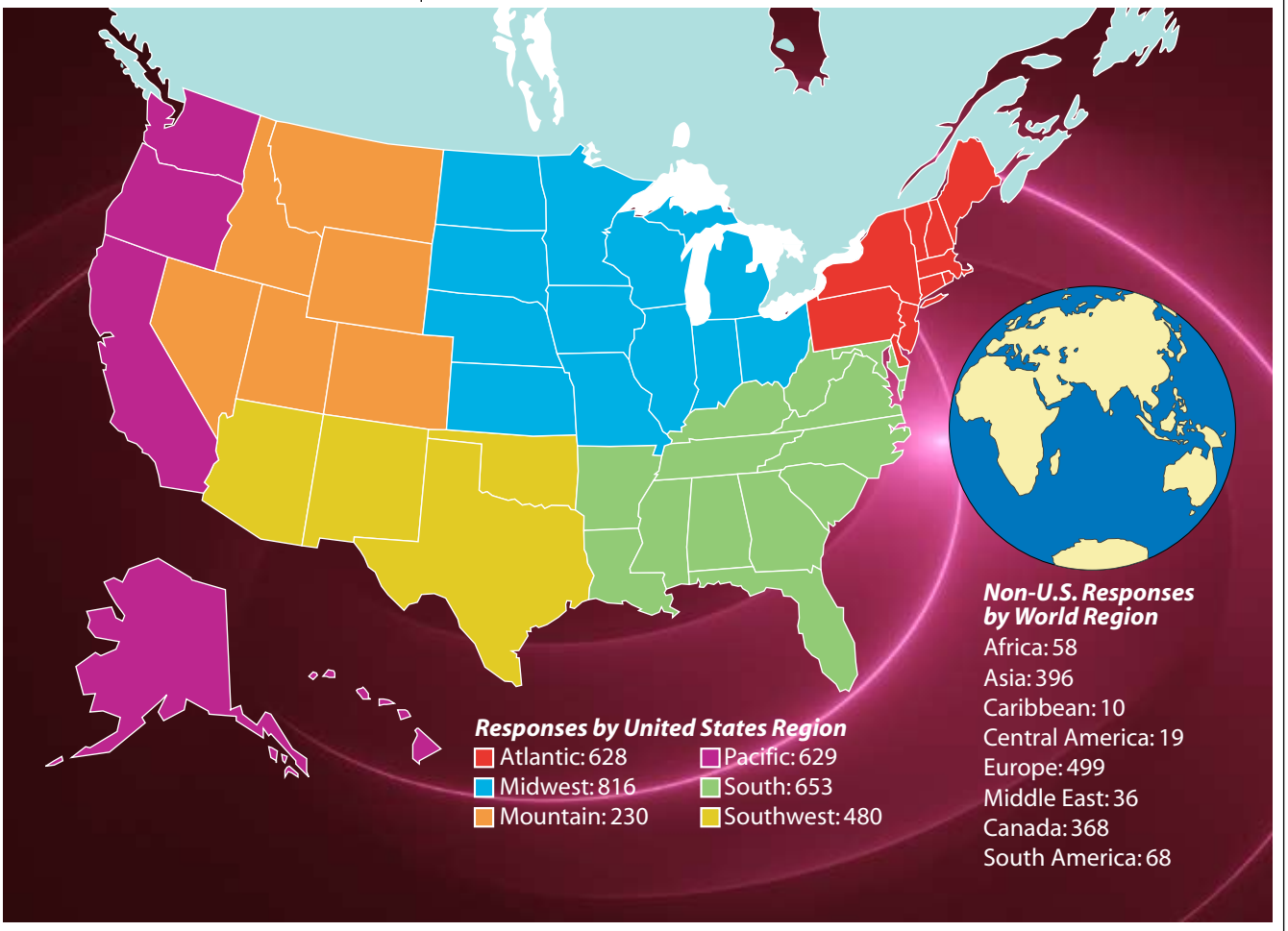
If you would like to know the average income (and more) of the remaining fields, you'll have to log in to the AUGI site and check it out from there. They are (in order of highest to lowest participation): Facilities Management, Interior Design, Telecommunications, Mining, Education/Training, Landscape Design/Architecture, Chemical, Electronics, Software, Aerospace, Shipbuilding, AudioVisual, Automotive, Medical, Building Automation, Semiconductors, Tool/Die/Molding, and Sales/Marketing.

Ready?

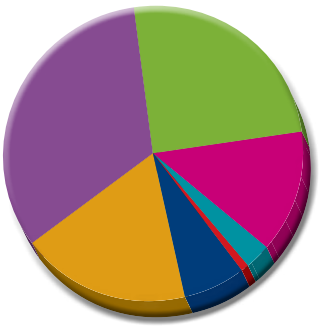
The results from all 14 job titles are presented here in the magazine. So dive in and take a look at some of the factors that affect pay such as your level of education, your years of experience, and the type of region in which you work.

If you have any questions, please read the FAQ posted on the AUGI website, and feel free to send suggestions to salarysurvey@augi.com.

Melanie Perry is Facilities-Engineering CADD/CAFM coordinator working for BJC Healthcare. She is the Salary Survey Manager, the AutoCAD Community Chair, Board Member for the Gateway AUG, and a freelance writer. You can contact Melanie via email at mistressofthedorkness@gmail.com.

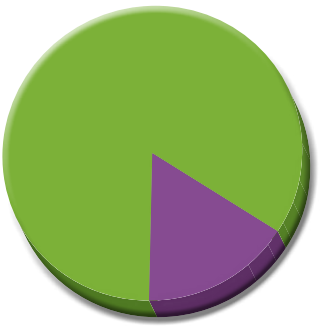


Employee Age



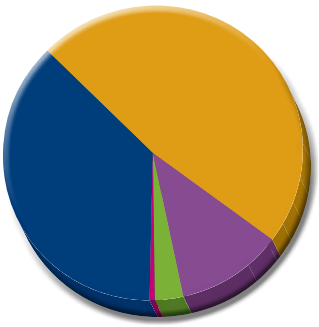
AGE	# RESPONDENTS
25-UNDER	330
26-30	896
31-40	1,615
41-50	1,227
51-59	659
60-65	134
65-OVER	30

Employee Gender



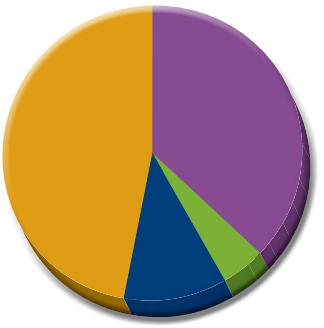
GENDER	# RESPONDENTS
MALE	4,114
FEMALE	777

Compensation



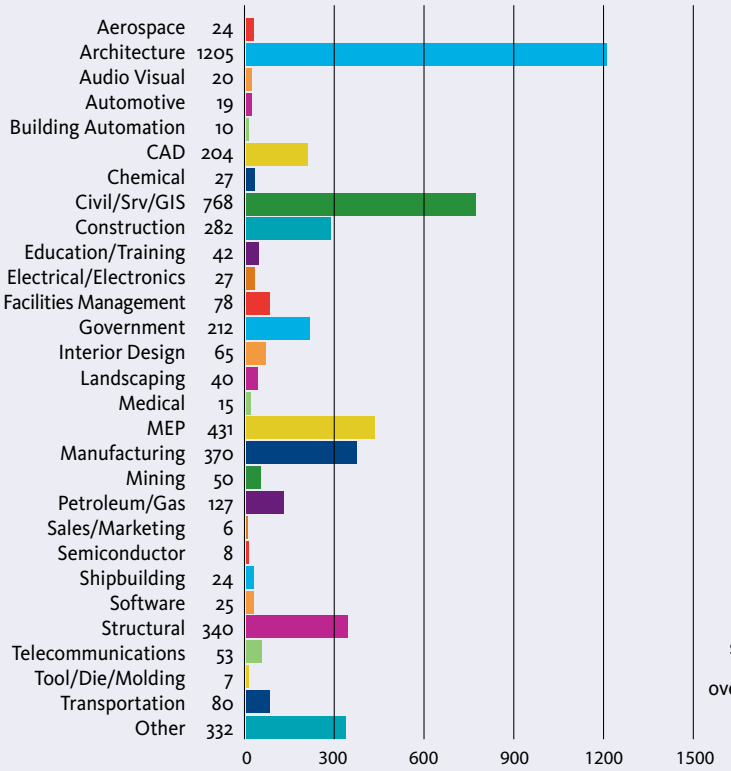
SALARY TYPE	# RESPONDENTS
HOURLY	1,832
SALARY	2,330
SALARY NE	556
SELF EMPLOYED	152
OTHER	21

Hours Worked Per Week

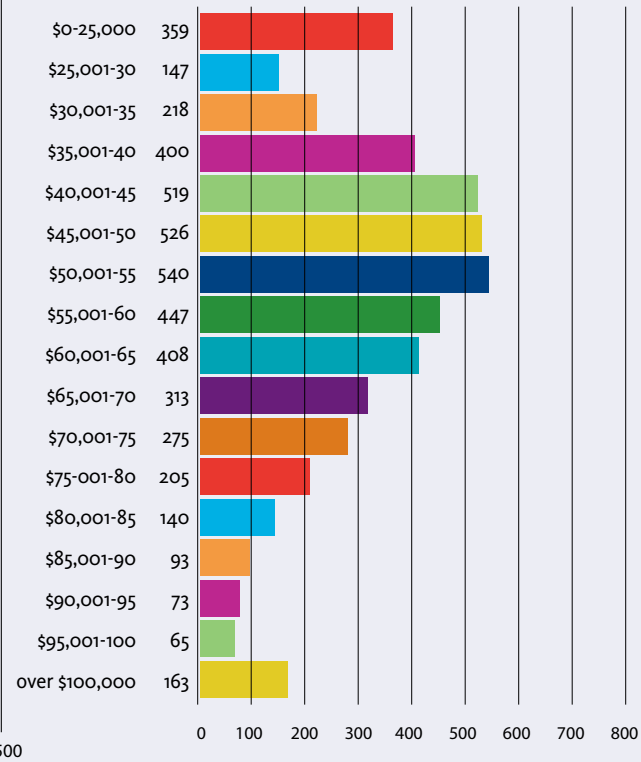


HOURS	# RESPONDENTS
UNDER 40	545
40	2,306
41-50	1,814
51-OVER	226

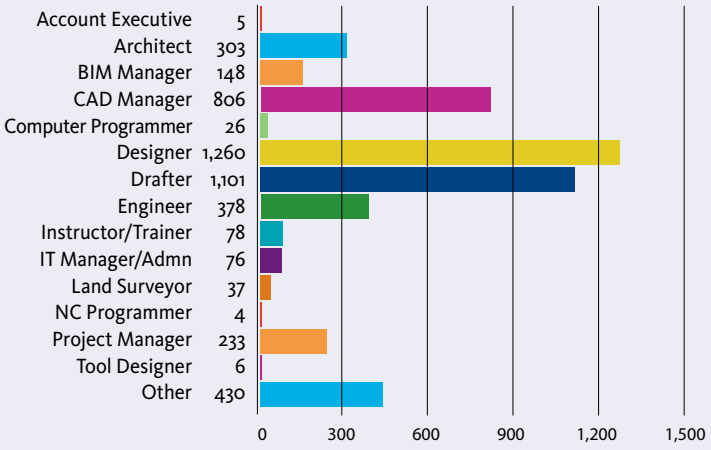
Field/Industry



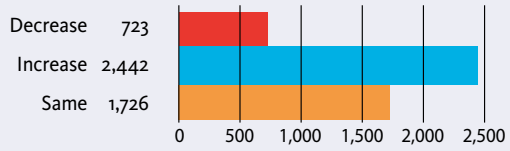
Annual Compensation in 2009



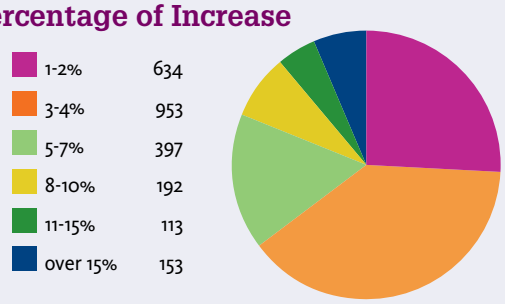
Job Title/Function



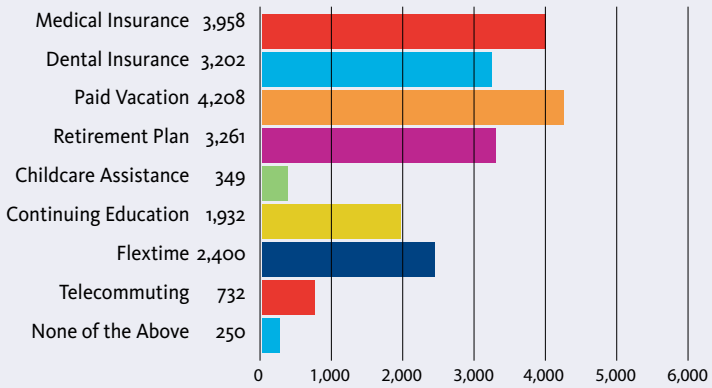
Salary Change in Last 12 Months



Percentage of Increase

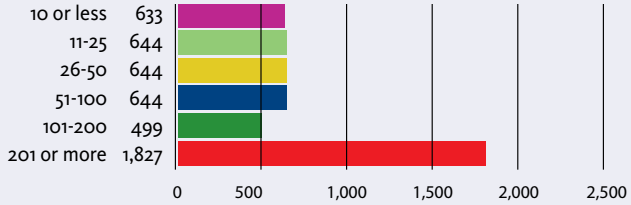


Employee Benefits



How Big Is Your Department

How Big Is Your Company

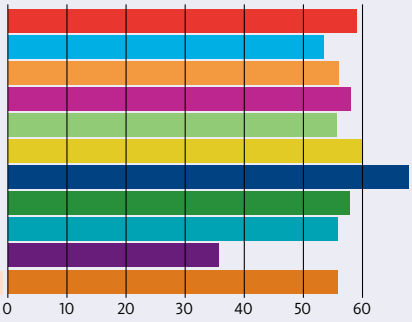


AVERAGE SALARY BY JOB TITLE/REGION

Survey respondents were asked to provide their salary data in U.S. dollars. They were given access to an online currency translator to assist them in this effort.

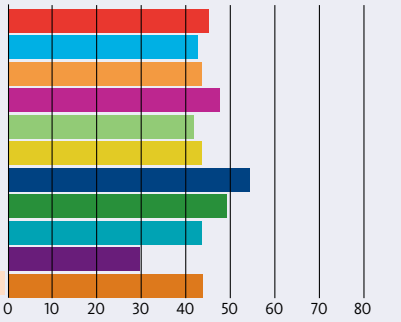
Designer

Atlantic	$ 58,539.60
Midwest	$ 53,009.95
Mountain	$ 55,466.10
Pacific	$ 57,536.76
South	$ 55,119.62
Southwest	$ 59,378.98
Australia	$ 67,226.56
Canada	$ 57,336.96
Great Britain	$ 55,250.00
Other	$ 35,275.00
Overall	$ 55,345.24



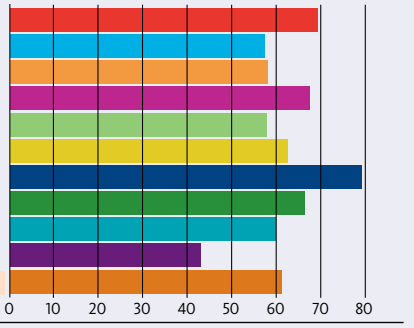
Drafter

Atlantic	$44,931.19
Midwest	$42,611.39
Mountain	$43,350.00
Pacific	$47,482.88
South	$41,597.74
Southwest	$43,533.65
Australia	$54,212.33
Canada	$49,000.00
Great Britain	$43,469.39
Other	$29,500.00
Overall	$43,619.44



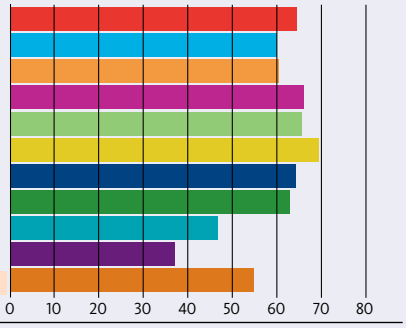
CAD Manager

Atlantic	$69,100.00
Midwest	$57,208.33
Mountain	$57,785.71
Pacific	$67,131.78
South	$57,626.26
Southwest	$62,171.05
Australia	$78,947.37
Canada	$66,093.75
Great Britain	$59,656.86
Other	$42,739.36
Overall	$61,014.27



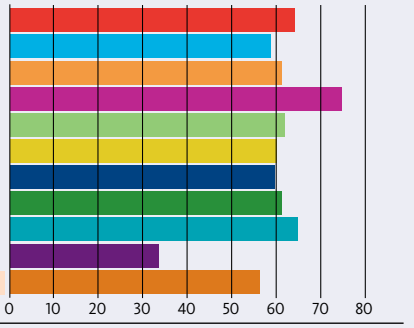
Engineer

Atlantic	$64,244.19
Midwest	$59,681.82
Mountain	$60,000.00
Pacific	$65,755.81
South	$65,174.42
Southwest	$69,090.91
Australia	$63,928.57
Canada	$62,500.00
Great Britain	$49,404.76
Other	$36,694.92
Overall	$54,470.90



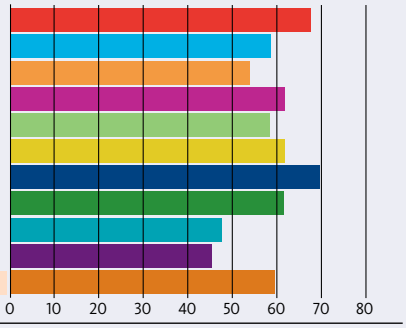
Architect

Atlantic	$63,910.26
Midwest	$58,418.37
Mountain	$60,961.54
Pacific	$74,404.76
South	$61,500.00
Southwest	$59,880.95
Australia	$59,375.00
Canada	$60,961.54
Great Britain	$64,464.29
Other	$33,433.33
Overall	$56,047.85



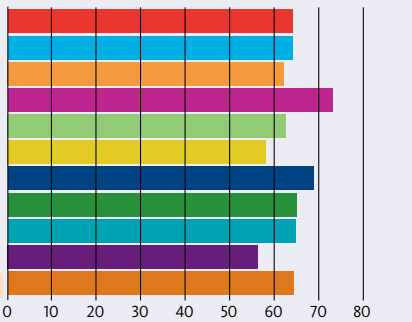
Project Manager

Atlantic	$67,343.75
Midwest	$58,333.33
Mountain	$53,750.00
Pacific	$61,666.67
South	$58,109.76
Southwest	$61,500.00
Australia	$69,500.00
Canada	$61,428.57
Great Britain	$47,500.00
Other	$45,104.17
Overall	$59,227.47



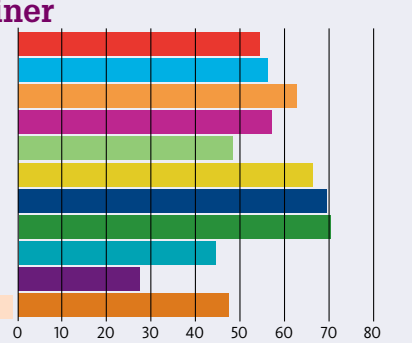
BIM Manager

Atlantic	$64,404.76
Midwest	$64,411.76
Mountain	$62,500.00
Pacific	$73,452.38
South	$62,884.62
Southwest	$58,409.09
Australia	$69,166.67
Canada	$65,227.27
Great Britain	$65,000.00
Other	$56,538.46
Overall	$64,611.49



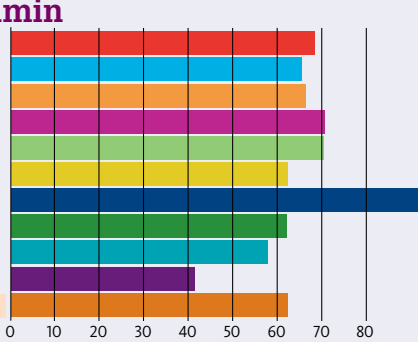
Instructor/Trainer

Atlantic	$54,166.67
Midwest	$55,833.33
Mountain	$62,500.00
Pacific	$56,785.71
South	$48,125.00
Southwest	$66,000.00
Australia	$69,166.67
Canada	$70,000.00
Great Britain	$44,166.67
Other	$27,232.14
Overall	$47,275.64



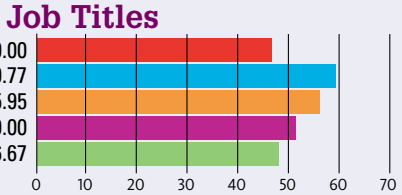
IT Manager/Admin

Atlantic	$67,954.55
Midwest	$65,000.00
Mountain	$65,833.33
Pacific	$70,227.27
South	$70,000.00
Southwest	$61,785.71
Australia	$97,500.00
Canada	$61,666.67
Great Britain	$57,500.00
Other	$41,166.67
Overall	$61,973.68



Miscellaneous Job Titles

Account Exec	$ 46,500.00
Computer Prog	$ 59,230.77
Land Surveyor	$ 55,945.95
NC Programmer	$ 51,250.00
Tool Designer	$ 47,916.67



Not Enough Response for Regional Breakdowns

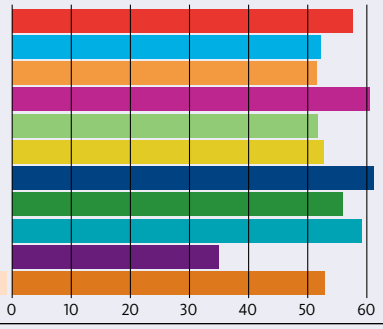
Additional information is available at augi.com/surveys.

AVERAGE SALARY BY INDUSTRY/REGION

This information pertains only to the top 10 disciplines.

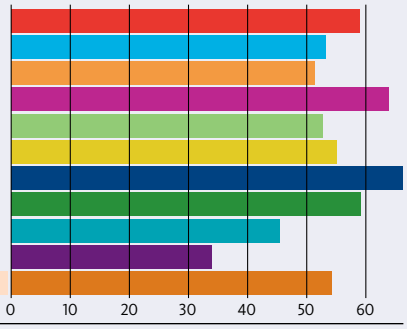
Architecture

Atlantic	$57,546.30
Midwest	$52,053.57
Mountain	$51,489.36
Pacific	$60,445.95
South	$51,547.62
Southwest	$52,635.14
Australia	$61,106.56
Canada	$55,879.12
Great Britain	$59,069.77
Non-US	$34,861.11
Overall	$52,736.51



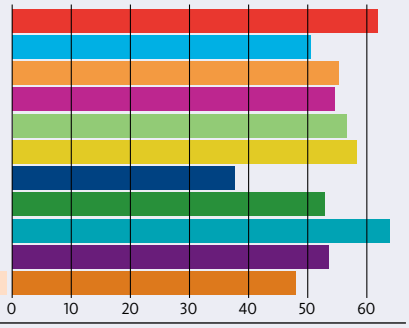
Civil/Surv/GIS

Atlantic	$59,191.18
Midwest	$53,398.44
Mountain	$51,569.77
Pacific	$64,114.58
South	$52,923.08
Southwest	$55,388.89
Australia	$66,500.00
Canada	$59,456.52
Great Britain	$45,645.16
Non-US	$34,141.79
Overall	$54,524.74



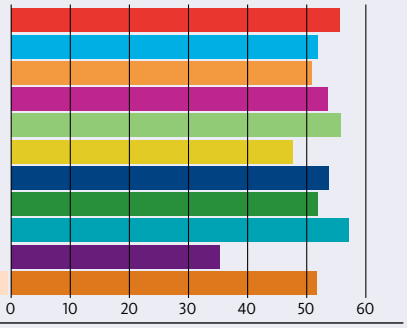
Manufacturing

Atlantic	$62,098.21
Midwest	$50,735.29
Mountain	$55,500.00
Pacific	$54,852.94
South	$56,730.77
Southwest	$58,500.00
Non-US	$37,857.14
Overall	$53,101.35
Australia	$64,166.67
Canada	$53,750.00
Great Britain	$48,214.29



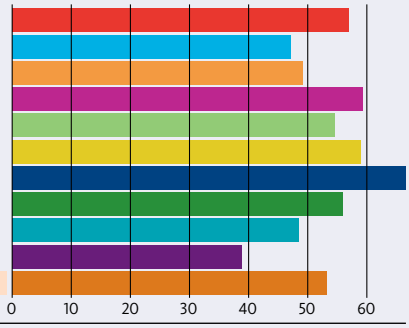
MEP

Atlantic	$55,740.74
Midwest	$51,970.59
Mountain	$51,000.00
Pacific	$53,660.71
South	$55,876.62
Southwest	$47,717.39
Australia	$53,928.57
Canada	$52,083.33
Great Britain	$57,352.94
Non-US	$35,441.18
Overall	$51,827.15



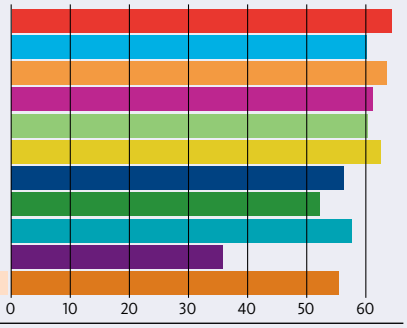
Structural

Atlantic	$57,196.97
Midwest	$47,267.44
Mountain	$49,318.18
Pacific	$59,574.47
South	$54,852.94
Southwest	$59,224.14
Australia	$66,875.00
Canada	$56,212.12
Great Britain	$48,706.90
Non-US	$39,081.63
Overall	$53,433.82



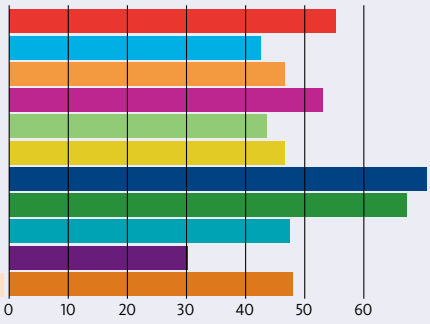
Construction

Atlantic	$64,568.97
Midwest	$60,326.09
Mountain	$63,750.00
Pacific	$61,500.00
South	$60,648.15
Southwest	$62,822.58
Australia	$56,562.50
Canada	$52,500.00
Great Britain	$57,916.67
Non-US	$35,921.05
Overall	$55,638.30



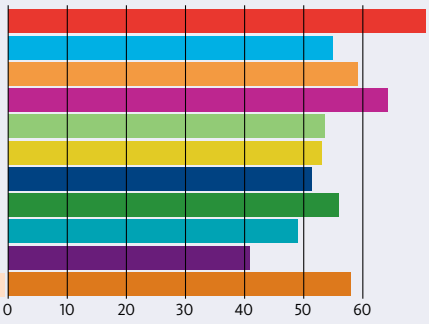
CAD

Atlantic	$55,416.67
Midwest	$42,678.57
Mountain	$46,875.00
Pacific	$53,214.29
South	$43,684.21
Southwest	$46,833.33
Australia	$75,441.18
Canada	$67,500.00
Great Britain	$47,700.00
Non-US	$30,384.62
Overall	$48,198.53



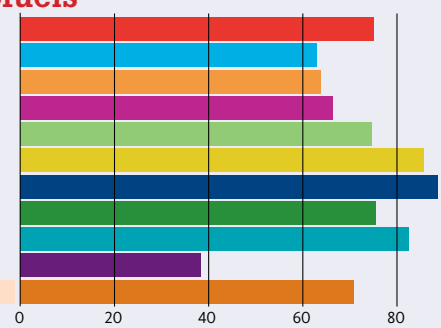
Government

Atlantic	$71,000.00
Midwest	$55,208.33
Mountain	$59,444.44
Pacific	$64,517.54
South	$53,785.71
Southwest	$53,289.47
Australia	$51,500.00
Canada	$56,184.21
Great Britain	$49,166.67
Non-US	$41,041.67
Overall	$58,266.51



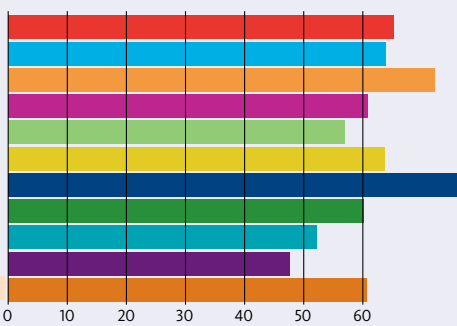
Petrol/Gas/Biofuels

Atlantic	$75,000.00
Midwest	$63,000.00
Mountain	$63,928.57
Pacific	$66,428.57
South	$74,722.22
Southwest	$85,763.89
Australia	$95,833.33
Canada	$75,555.56
Great Britain	$82,500.00
Non-US	$38,289.47
Overall	$70,905.51



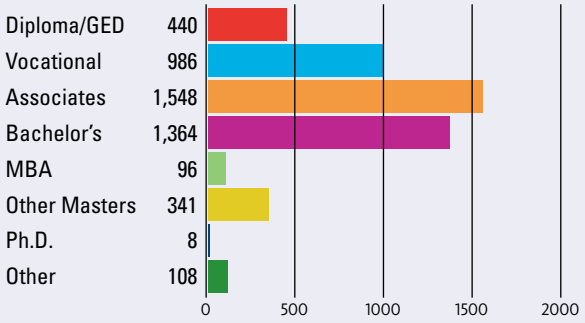
Transportation

Atlantic	$65,576.92
Midwest	$64,166.67
Mountain	$72,500.00
Pacific	$61,111.11
South	$57,115.38
Southwest	$63,928.57
Australia	$77,500.00
Canada	$60,416.67
Great Britain	$52,500.00
Non-US	$47,857.14
Overall	$60,875.00

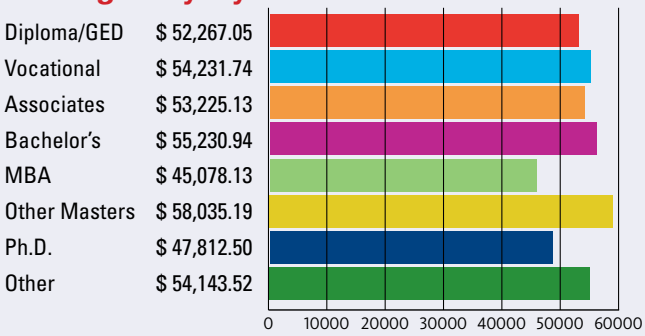


AVERAGE SALARY BY MAJOR FACTORS

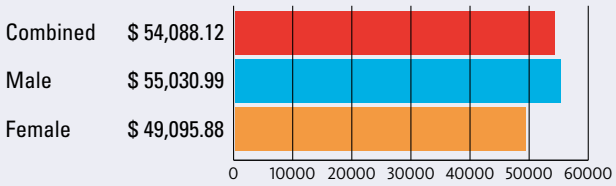
Education Level/Degree Attained



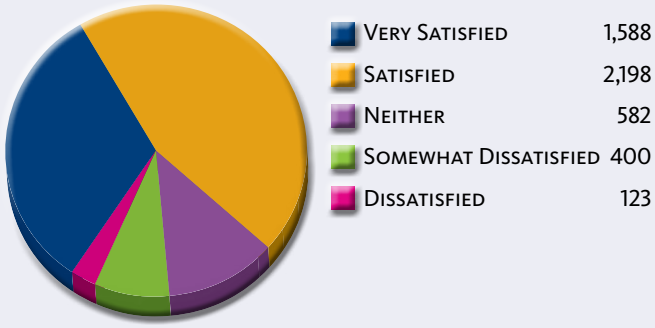
Average Pay By Education Level



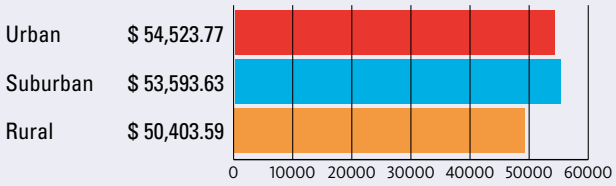
Average Pay Per Gender



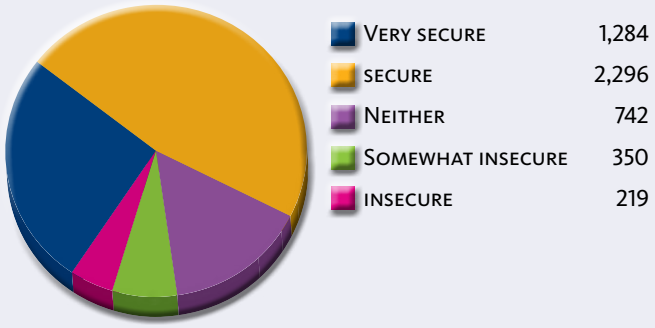
Feelings of Job Satisfaction



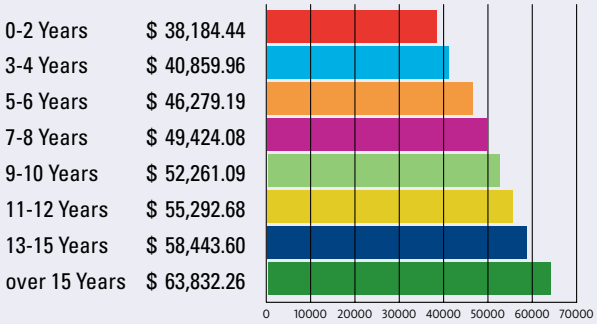
Average Pay By Work Location



Feelings of Job Security



Average Pay By Years of Experience



Additional information is available at augi.com/surveys.

Parametric Constraints

Parametric Constraints are one of the many new features in AutoCAD® Architecture 2010. Currently, Parametric Constraints apply to 2D objects and I look forward to future releases where they will apply to 3D objects. I'm sure this is only a matter of time!

AutoCAD Architecture 2010 features Geometric Constraints, which control object spatial relationships, and Dimensional Constraints to control size. Each of these can be used for limited manipulation of 3D objects. This article will look at an overview of constraints to give you an idea of how they can be used. Let's start with a brief overview.

Overview

In a parametric drawing, you can add constraints to geometry to ensure that your design conforms to specified requirements. Parametric drawing can be defined as a technology that is used for designing with constraints. Constraints are defined as restrictions and associations that are applied to 2D geometry.

There are two types of constraints: geometric and dimensional. Geometric constraints are used to control the relationships of objects in respect to each other. Dimensional constraints are used to control the distance, angle, radius, and length values of objects.

A blue cursor icon will always display when you move your cursor over an object that has constraints applied to it. Constraints provide a way to enforce requirements when looking at different designs or when making changes in the design phase of a project. With constraints you can:

- Include formulas and equations within dimensional constraints.
- Maintain design requirements and specifications by constraining the geometry within a drawing.
- Instantly apply multiple geometric constraints to objects.
- Change the value of a variable to make design changes quickly.

Please note that you should first apply geometric constraints to determine the shape of a design and then apply dimensional constraints to determine the size of objects in a design.

Parametric constraints have a dedicated ribbon tab that groups the tools and their visibility controls in a logical arrangement. A new Parametric Manager Palette allows tabular editing of names, values, and formulas once dimensional parameters are applied. This new palette can be launched from the ribbon. (See Figure 1.)

Now that we have an understanding of constraints, we will look at Geometric Constraints followed by Dimensional Constraints, as well as some uses of constraints.

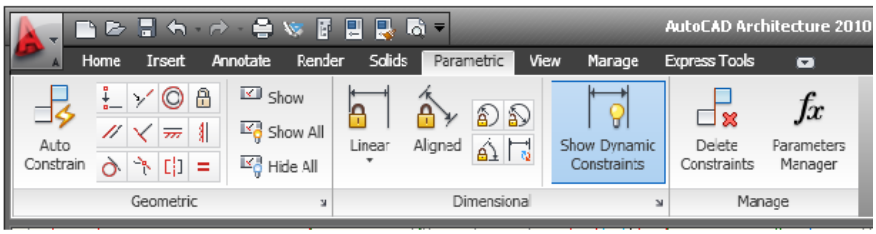


Figure 1: Parametric palette

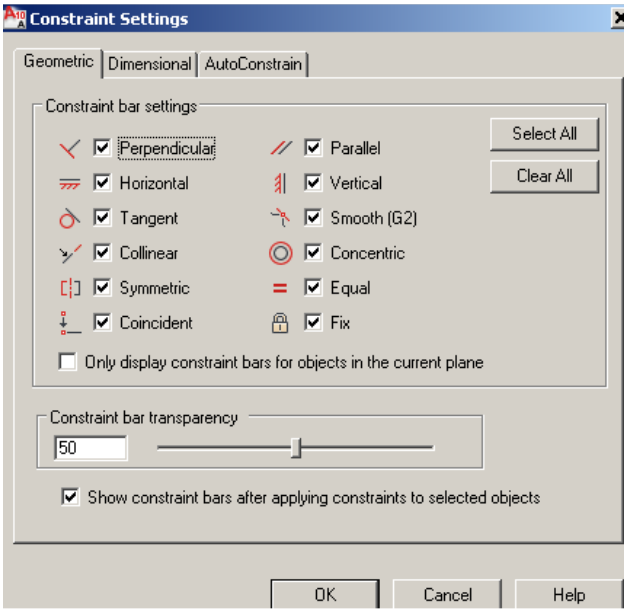


Figure 2: Geometric constraints

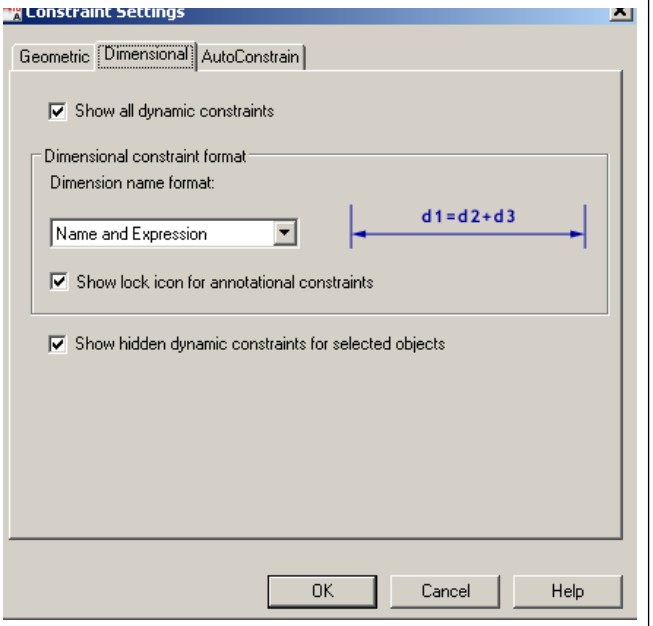


Figure 3: Dimensional constraints

Geometric constraints

Geometric constraints are used to determine the relationships between 2D geometric objects or points on objects relative to each other. When the constrained geometry is edited, the constraints are maintained. Therefore, you have a method of including design requirements in your drawing by using geometric constraints.

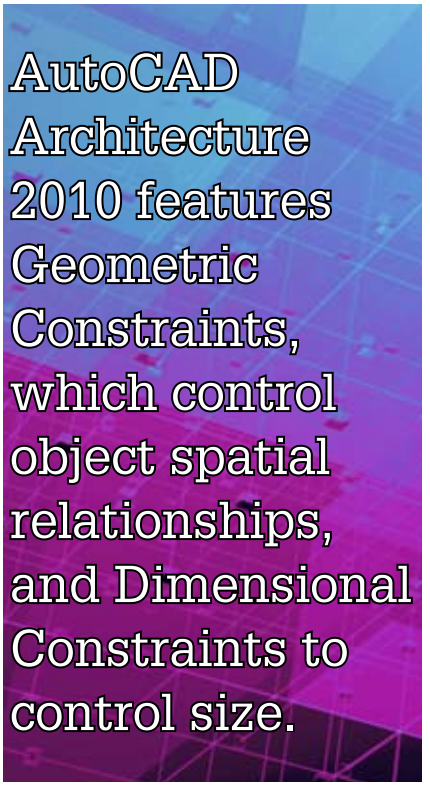
Geometric constraints contain controls for Coincident (with other object points), Fix (to an absolute location), Horizontal, Vertical, Concentric, Tangent, Parallel, Perpendicular, Colinear, Smooth (join splines), Equal, and Symmetric (matches characteristics about an axis)—see Figure 2. When these are added to the drawing, the first object that you select becomes the master and subsequent elections follow it.

When a constraint is applied, the selected object will automatically adjust to conform to the specified constraint and a gray constraint icon will display near the constrained object. A small, blue glyph displays when you move your cursor over an object that is constrained. Once a constraint has been applied, only changes to geometry that do not violate the constraints are permitted.

With some geometric constraints, you can specify constraint points on objects instead of selecting the objects. This is similar to object snaps; however, the locations are limited to center points, mid points, endpoints, and insertion points.

Multiple geometric constraints can be applied automatically and manually. If you want to apply all essential geometric constraints to a drawing automatically, you can use the AUTOCONSTRAIN command with the objects that you select.

Even though a geometric constraint cannot be modified, you can delete it and apply a different one. This option is available from the shortcut menu. You can also delete all constraints from a selection using the command DELCONSTRAINT.



Dimensional constraints

Dimensional constraints are used to control the proportions and size of a design. They can constrain distances between objects, sizes of arcs and circles, and angles between objects. If the value of a dimensional constraint is changed, all the constraints that are in the object are evaluated. The objects that are affected are automatically updated. You can also add constraints directly to segments within a polyline as if the objects were separate.

It is important to note that dimensional constraints are different from dimension objects. Dimensional constraints drive the angle or size of objects; however, dimensions are driven by objects. Dimensional constraints are used in the design phase of a drawing, whereas dimensions are usually created in the documentation phase.

Dimensional constraints can be created in the following forms: dynamic constraints and annotational constraints, as shown in Figure 3. Dynamic constraints are ideal for normal parametric design and drawing tasks. They display a fixed dimension style, maintain the same size when zooming in or out, position textual information automatically, and do not display when the drawing is plotted.

Annotational constraints are more useful when you want dimensional constraints to change size when zooming in or out, display individually with layers, and display when the drawing is plotted.

There are also reference constraints, which are driven by dimensional constraints and can be either dynamic or annotational. Reference constraints do not control the associated geometry, but instead report a measurement similar to a dimension object. This is a convenient way to display measurements that you would

otherwise have to calculate. Textual information in reference constraints will always be shown in parentheses.

The reference property can be set in the Properties palette to convert a dynamic or annotational constraint to a reference constraint. (See Figure 4.) However, you cannot change a reference constraint back to a dimensional constraint if this would overconstrain the geometry.

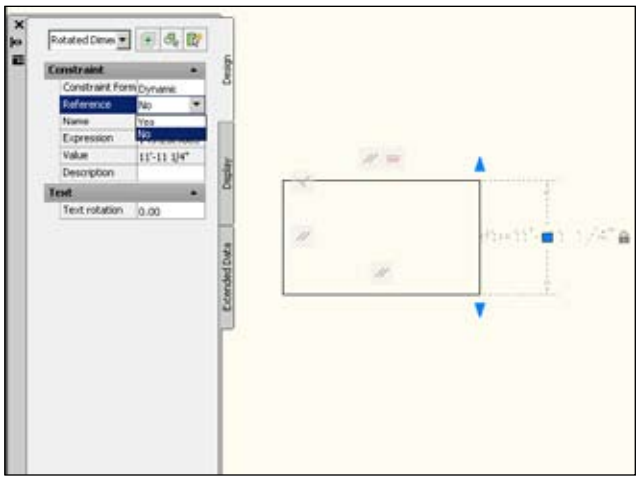


Figure 4: Reference constraints

Design using constraints

When you are creating or changing a design, a drawing will be in one of three states:

- Fully constrained – all relevant geometric and dimensional constraints are applied to the geometry. For a fully constrained set of objects, you will need to include at least one Fix constraint to lock the location of the geometry.
- Unconstrained – no constraints are applied to any geometry.
- Underconstrained – some constraints are applied to the geometry.

Please note that AutoCAD Architecture prevents you from applying any constraints that result in an overconstrained condition.

For designing with constraints, there are two basic methods.

1. Work in an underconstrained drawing and make changes as you go.
2. Create and fully constrain a drawing first. In this way, you can control the design by relaxing and replacing geometric constraints and changing values in dimensional constraints.

Your choice of method will depend on your design practices. Both are equally effective depending on your needs.

Use constraints with blocks and xrefs

You can apply constraints between the following:

- An object within a block reference and an object within a drawing.
- An object within a block reference and an object within a different block reference (not within the same block reference).
- The insertion point of an xref and a block or an object, but not to any objects within xrefs.

When constraints are applied to block references, you can automatically select objects contained within the block. You do not need to press Ctrl for subobject selection. Adding constraints to a block reference can many times cause it to rotate or move as a result.

When you apply constraints to dynamic blocks, the display of their dynamic grips is suppressed. You can still use the Properties palette to change the values in a dynamic block, but the constraints must first be removed from the dynamic block in order to redisplay the dynamic grips. Constraints can be used in block definitions, which results in creating dynamic blocks. You can control the shape and size of dynamic blocks directly from within the drawing.

Remove or relax constraints

You can cancel the effects of constraints when you need to make design changes by using one of two methods.

1. Delete each of the constraints individually and then later apply new constraints. While the cursor hovers over a geometric constraint icon, you can use the delete key or the shortcut menu to delete the constraint.
2. Relax the constraints temporarily on selected objects to allow you to make the changes. With a grip selected or when you specify options during an editing command, use the Ctrl key to alternate between relaxing constraints and maintaining constraints. (See Figure 5.)

Relaxed constraints are not maintained during editing. If possible, constraints are restored automatically when the editing process is complete. Constraints that are no longer valid are removed.

Conclusion

Parametric constraints is a great new tool with many design possibilities. They can be used to great lengths in AutoCAD Architecture when designing in 2D. For all 3D users of the software, it is only a matter of time before we can take advantage of parametric constraints. I encourage everyone to play around with parametric constraints and see how they can best work for you!

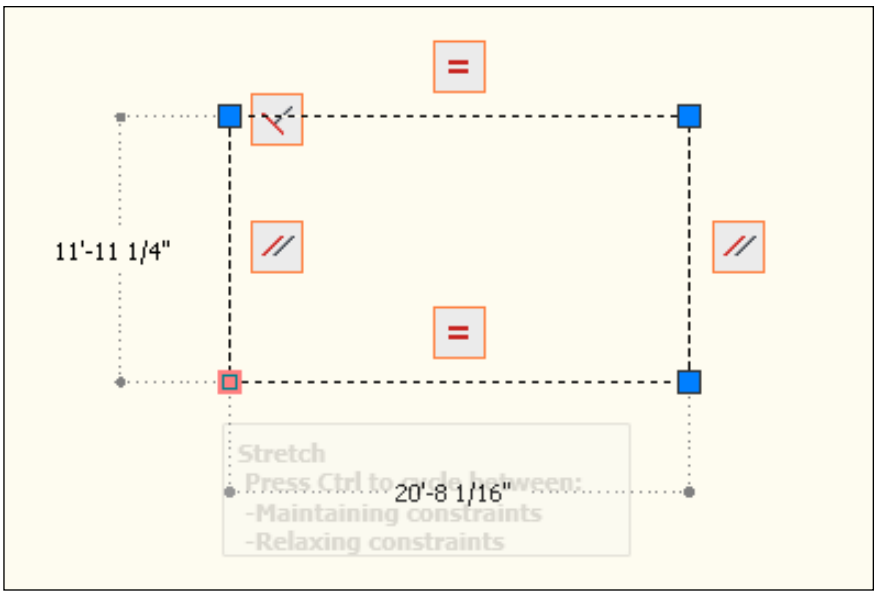


Figure 5: Relaxing constraints

Melinda Heavrin is a CAD Coordinator for Norton Healthcare in Louisville, Kentucky. She can be reached for comments and questions at melindaheavrin@alltel.net.

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Living in the Material World

Controls and Interface for Materials in Revit 2010

Editor's note:

Autodesk Revit is built on the principle that making a complete and accurate building model cuts down on the work of drafting and detailing. No part of the model's properties has a greater effect on this than the materials you apply to model objects. In this column we examine the humble materials that many of us may take for granted when creating or working with building models, and show how to use materials to control the appearance of all your views.

–Chris Fox, AUGI Revit Editor

Property management

Just about everything in an Autodesk® Revit® model except a model line has material properties. Even text (model text) can be assigned a material! Depending on the nature of the object you are working with, you may have to dig a little to find where to assign materials. Walls, which are so basic to every building model, are actually some of the harder things to work with because it takes repeated clicks to access and assign materials.

Walls are perfect examples of how the proper use of materials controls the appearance of model objects in different views to save you work in detailing and documenting. Suppose you are working with a humble concrete block (also called CMU for concrete masonry units) wall. You have to be familiar with Type Properties and Wall Structure to define this wall's materials.

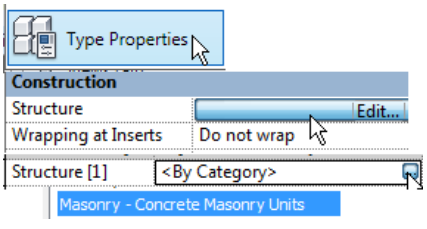

Figure 1: Assign a material to a wall layer—numerous clicks, but worth the effort.

The materials dialog

You can change the appearance of the dialog itself. By default it contains two panes, with a list of materials in your project on the left and control tabs on the right. In a large project your materials list may be very extensive, so there is a search field at the top by which to filter. You can have your list appear with or without icons. You can search by material class.

You can duplicate material names at any time to create custom appearances. When you enter the materials dialog from the Manage tab you can also rename or delete materials definitions. These last two options are not available when you are assigning materials.

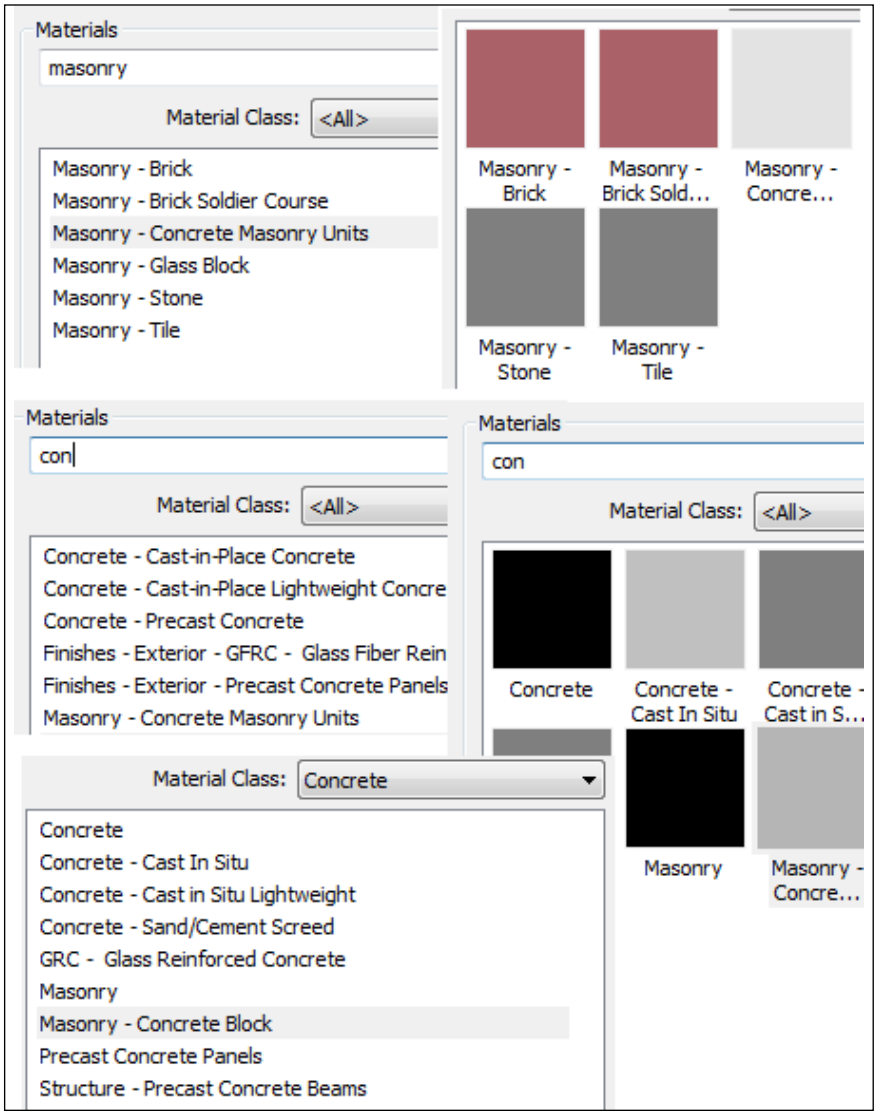

Figure 2: The materials list is configurable.

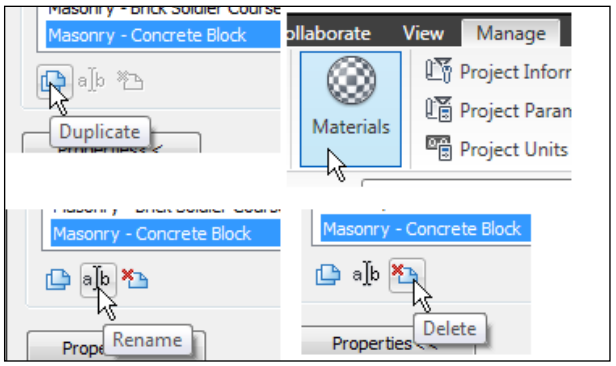

Figure 3: Create your own materials.

The right pane of the materials dialog, which you can hide, holds tabs where you define the appearance of the selected material. You will set conditions on the Graphics tab the most often. The Shading, Surface Pattern and Cut Pattern controls set the color and linework for your materials in all views. We'll talk more about the patterns shortly.

As a tip, consider this: set the Shading color for a Generic material to a bright color, and assign that Generic material to your generic wall types. These wall types will then show up clearly in elevations and 3D views when you turn on Shading or Shading with Edges, so you can verify wall type assignments during Design Development.

You can also use the Shading control to make a material partially or fully transparent. This affects all objects that use this material in elevation or 3D views. It can be an effective technique for presentations or model study.

I have covered the controls on the Render Appearance tab in another article. For those of you doing interior design, or those producing presentation images, time spent

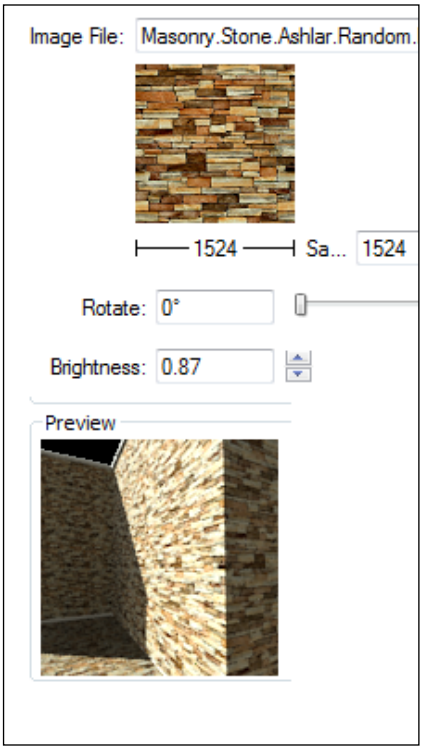

Figure 4: Import and check your own digital images for render materials.

setting the Render Appearance properties for your materials is well worth the effort. Remember that you do not actually edit the definitions you select in the Render Appearance library; consider those templates that you customize in your named material definitions. You can import your own images with mapping controls and you can check the appearance of your material in a preview window.

Do I see a pattern here?

The whole point of assigning Surface Patterns and Cut Patterns by material is to simplify your detailing work. Surface patterns define the appearance of walls, floors, roofs, and other objects in elevation and 3D views. Cut patterns show in plans and sections when they are set to Medium or Fine Detail Level. Surface patterns are Model patterns; that is, they resemble actual built objects such as brick, block, siding, shingles, and so on. These do not scale with the view. Cut patterns, which show when objects are cut in section or plan views, are abstract patterns according to recognized drafting standards and do scale with the view so they print appropriately.

Revit's Fill Patterns are very simple: simple arrangements of lines by offset distance and angle, with the option of crisscrossing them, and that's about it. You can import complex drafting patterns if you have access to .pat (AutoCAD Hatch Pattern) files.

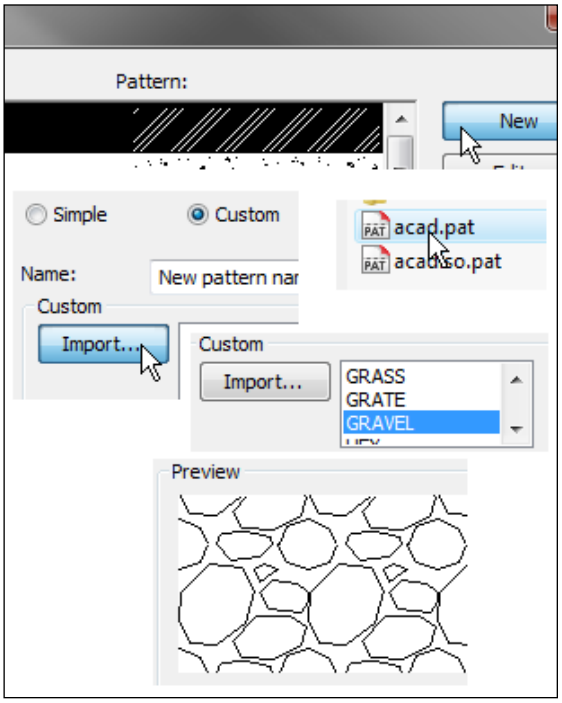

Figure 5: You can get curved lines into patterns if you import them.

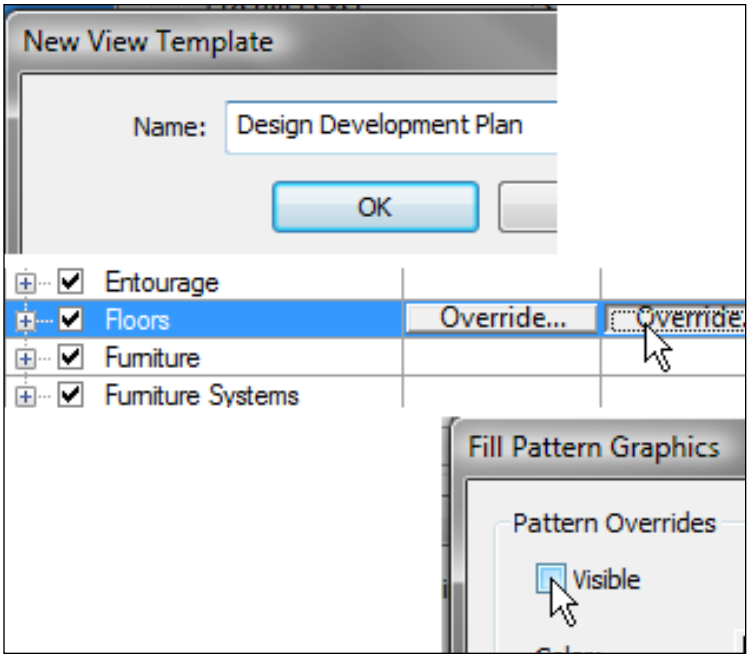

Figure 7: Control material display in more view than one by using templates.

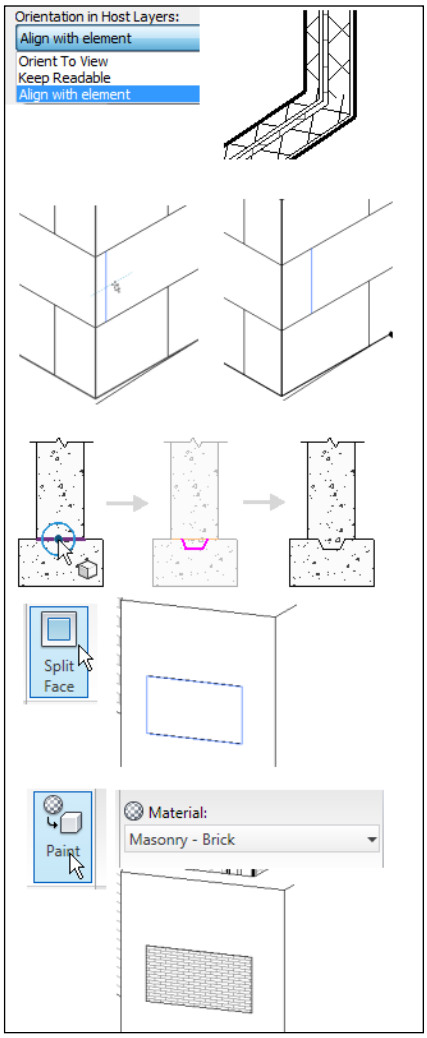

Figure 6: You can work with material Fill Patterns in various ways.

You can orient drafting patterns used in Host Layers (in walls, floors, roofs, etc. when cut) to the View or to Align with the Element, depending on your drafting standards.

You can reach the lines in Surface (model) patterns on wall faces and align them as necessary to make elevations or 3D views read properly. To do this, place the cursor over a wall and press Tab until you see a pattern line highlight; you then select and move the line into another position. This edit persists in relevant views-such as elevations and 3D.

The Cut Profile tool on the Edit Linework panel of the Modify tab is simply a graphic override that bleeds one material cut pattern into an area that you sketch on top of another pattern. This works on items that are cut in the view, such as the wall and footer shown in the image. This material appearance edit is view specific and does not affect the model.

The Split Face and Paint tools on the Edit Face panel of the Modify tab allows you to subdivide the face of a wall or floor and place a new material surface pattern in the new regions. This is also simply a graphic override for the sketched area. The painted material will be visible in all relevant views.

What you see is what you get

Remember that material patterns can be controlled across views by using view templates. Concrete floors and gypsum board ceilings, which have no pattern applied in the default material definitions, can be notoriously hard to work with in plan views, or even to detect if they are present.

Consider defining specific materials for floors and ceilings with a surface pattern such as sand. Rather than change the materials late in the project to remove the pattern in plans where it will interfere with detailing, create view templates for plans that show surface patterns and plans without patterns (Design Development plans and Construction Documents plans).

These view templates can turn on or off the display of surface patterns for floors or ceilings. Swapping view templates is quick and easy and won't affect material definitions in unrelated views, which can be a problem with changing materials late in a project.

Have no fear when working with materials; if in doubt, create new materials for testing, just like your duplicate wall types and other objects.

Chris Fox is the Revit editor for AUGIWorld, and has written numerous articles on Revit Architecture, Revit Structure, and Revit MEP. He has written Autodesk Official Training Courseware for Revit Architecture and Revit Structure and Introducing and Implementing Revit Architecture 2010, published by Autodesk Press. Based in Australia, Chris leads training classes in Revit through corporate, university and technical school contacts. You can reach him at chris.fox@archimagecad.com.

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Instant Productivity with AutoCAD Mechanical Basics

AutoCAD® Mechanical has been around since AutoCAD R14. In the first release, basic annotation tools such as geometric tolerances, weld symbols, and surface texture made mechanical drafting easier. Since those early days, the software has expanded into a feature-packed, time-saving mechanical design tool. In this article, we will learn about a few AutoCAD Mechanical features that can be used with virtually no learning curve.

Zero-learning-curve features

Warm-ups

In order to get the blood flowing and get loose before we lift the heavy stuff, we will start with a little light lifting in the form of some nice drafting tools.

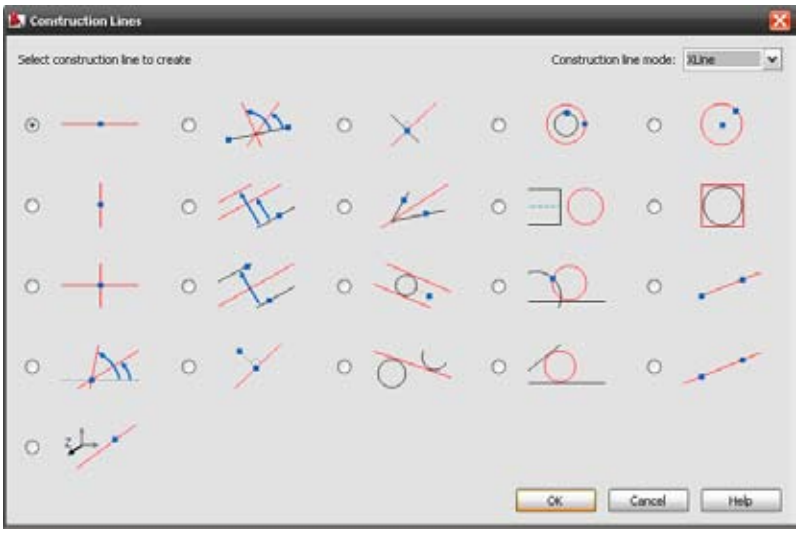


Figure 1

Construction lines

With every drawing you create, you end up generating construction geometry that gets used to help finalize your drawing. AutoCAD Mechanical has more construction lines than I could ever use:

- at a distance from a line
- at an absolute angle
- at an angle relative to another line
- bisecting an angle
- circular tangential to two lines
- concentric circles
- perpendicular to a line
- perpendicular to two points
- tangential to a circle
- tangential to a line
- tangential to two circles

My personal favorite is the "Automatic C-line creation" command, which is run by typing "AMAUTOCLINES" at the command line.

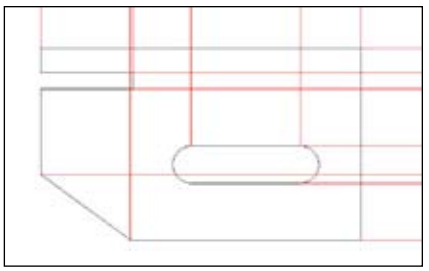


Figure 2: Example result of Automatic C-Line creation.

Centerlines

Back in the day, I would do centerline creation near the end. Now, AutoCAD Mechanical centerlines can be created while your draw your objects (see Figure 3).

- centerline cross with angles
- centerline cross on a full circle
- centerline cross on a plate
- centerline cross in a corner
- centerline cross in a hole
- centerline between two lines
- centerline cross
- centerline cross with a hole

In the example in Figure 4a and 4b you can see how the "Centerline cross on a plate" can automate common drafting tasks.

It's a (Power) snap

As long-time AutoCAD users, we love running object snaps. We also have just grown accustomed to turning a few on and off throughout the day to accommodate the given task. Or maybe you still prefer to use the single-object snap for every click.

Figure 3

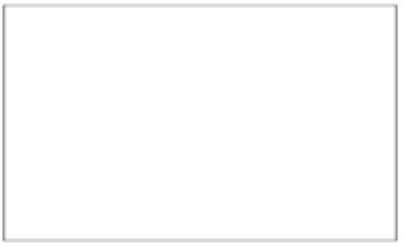


Figure 4a: Before Command

Figure 4b: After Command

The Power Snap command allows you to have four preset configurations of your object snap settings. Each one of these configurations can be easily toggled by using the Power Snap pull-down menu shown in Figure 5 below. Another hidden jewel is the entity filter, which allows you to ignore things such as hatch.

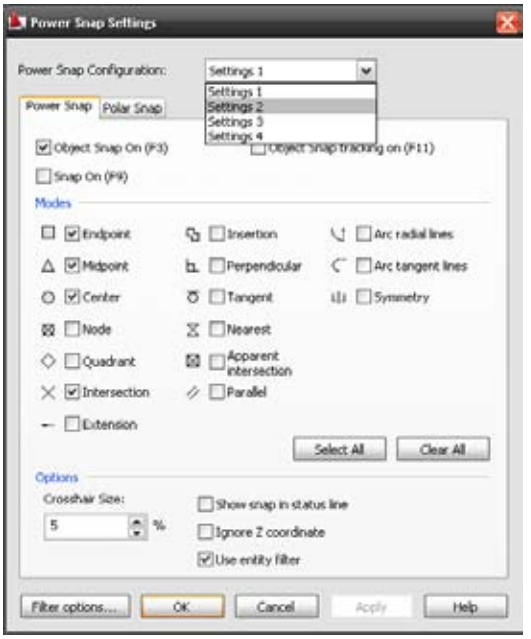


Figure 5

Associative hide

Line by line, window select, and quick select make your hidden layer current prior to drawing. All of these workflows listed will get the job done, but not at the same caliber as AutoCAD Mechanical. The Associative Hide command allows you to select any collection of lines and tag them as being in front of other lines. After this selection set is complete, any line that should be hidden instantly becomes hidden. Now, if that isn't cool enough for you, these hide situations update as the data changes. Moreover, these hide situations are kept track of in the drawing so they can be adjusted and recalled at anytime.

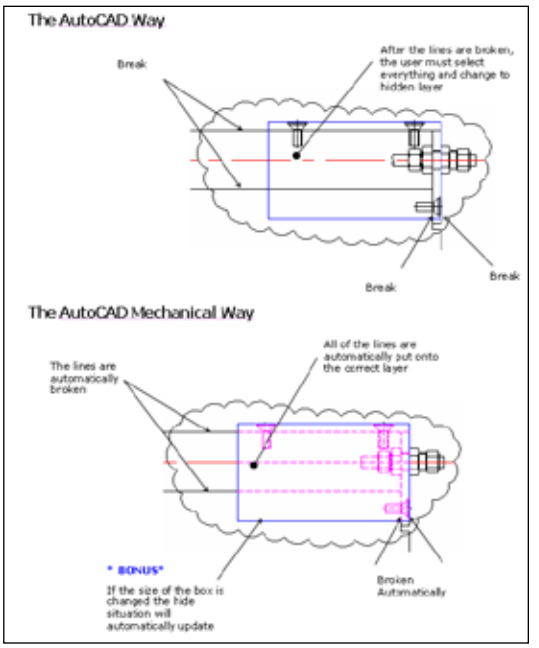


Figure 6

Power dimensioning

Back when I had a "real" job doing design, I could not stand doing dimensioning. Luckily I had a few interns working for me who needed the practice. AutoCAD by itself has made great strides within its dimensioning feature set. The ability to tweak decimal precision, style, and text position on the fly speeds up formatting. However, for things such as tolerances, AutoCAD still needs some work for the demands of a mechanical drawing (see Figure 7).

Enter AutoCAD Mechanical's Power Dimensioning command, which combines linear, angular, baseline, chain and diametric or radial, all in one command. Each one of these dimension types can be invoked with a simple right-click and selection from the menu.

In addition to cutting down on the number of dimension commands needed, instant formatting of each dimension is a breeze with the Power Dimensioning dialog. Long gone are the days of memorizing dimension overrides and creating one-off dimension styles to suppress a dimension line that overlaps another line (see Figure 8).

Another great dimension tool is the Automatic Dimensioning command, which allows even further automation of tedious dimension tasks.

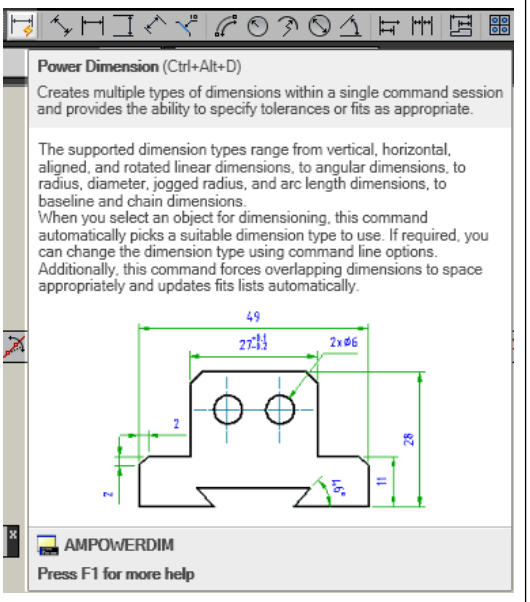


Figure 7

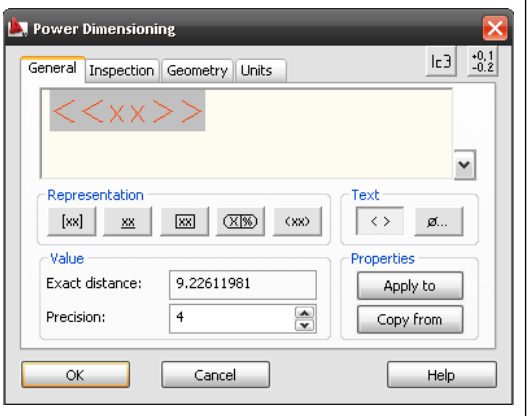


Figure 8

Screws, nuts, clevis pins, and steel shapes...oh my!

Gone are the old days of opening the machinery's handbook and looking up tables in order to draw fasteners or tapped holes. This is good since my copy of the book was never broken in enough to stay open on my desk. More than 750,000 parts ship with AutoCAD Mechanical—parts that can be quickly placed, edited, and swapped out.

For all the content placed you can also right-click on each one and choose Power View to quickly generate an orthographic view such as front, right, or bottom. In addition to placing hardware as separate parts, you can use the Screw Connection command to place multiple parts at once. This command can place the screw, washer, clearance hole, tapped hole, and nut as needed.

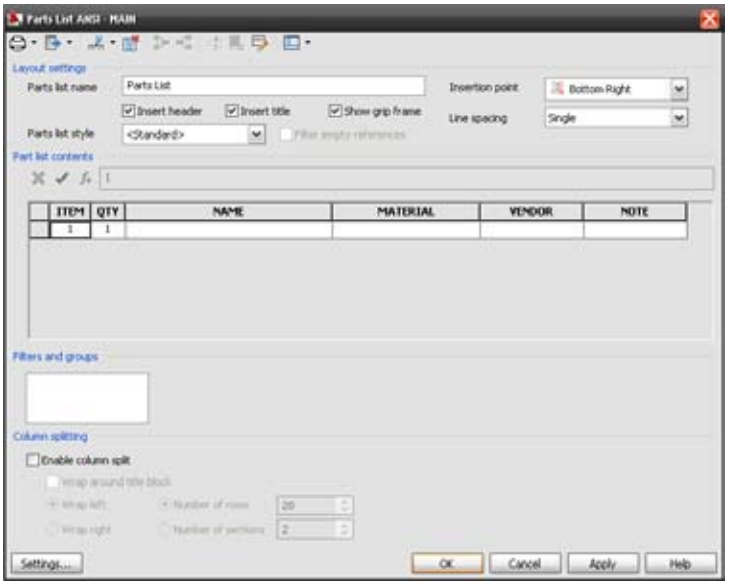


Figure 10

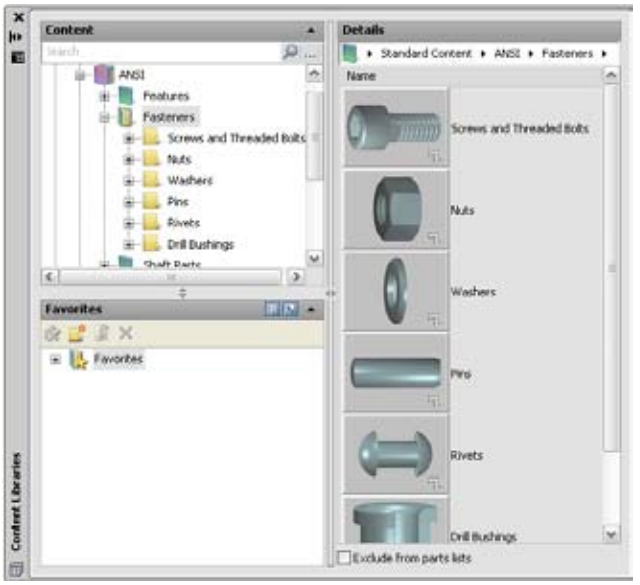


Figure 9

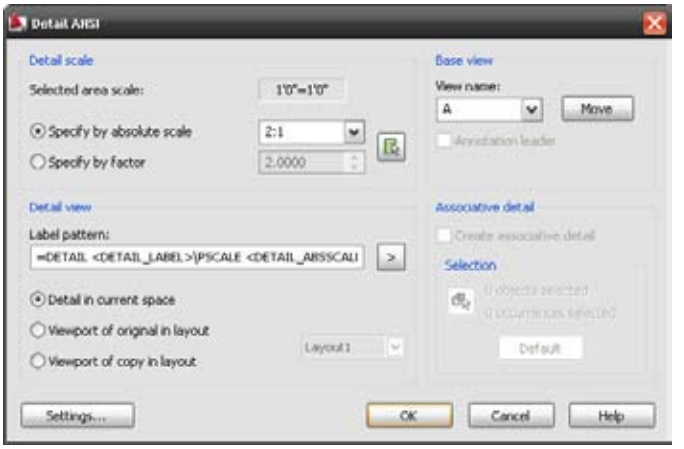


Figure 11a

Bill of materials and parts list

Most of you probably have a block file that contains the header for your parts list and the first line of text to reuse and copy or array as needed. Once you have the number of lines required for your assembly, you begin the daunting task of filling out each line for all of your parts.

Hopefully, some of you have existing parts lists on other drawings from which to borrow descriptions versus retyping them. Within AutoCAD Mechanical, parts lists can be automatically generated. All the standard content within the software already contain descriptions.

For your parts you have two choices. You can add a Part Reference to any block or collections of lines while you draw them or you can add the reference tags to your existing library of blocks. For either approach, AutoCAD Mechanical will take whatever you have typed in and the number of times you use that item and keep your parts list updated. If you need to change the description of any given part, you simply double-click on the part, parts list, or the balloon to change the description in all three places (see Figure 10).

Detail view creation

When creating those shop drawings you always try to ensure that you give the adequate amount of drawing information needed to make the part. Frequently the use of detail or scaled views helps convey the important design information in areas of complexity. In core AutoCAD, you take these steps.

1. Draw a circle of the desired area.
2. Copy the objects and the circle.
3. Place elsewhere and begin trimming up all the data outside the circle.
4. Scale up as needed.
5. Add dimensions with the proper DIMLFAC.

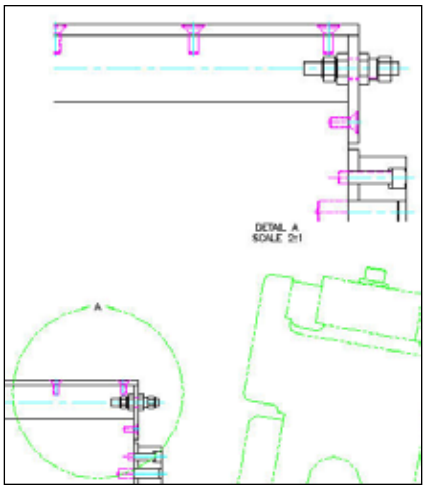


Figure 11b

For those using paper space, which I'll bet is few and far between, you would create a viewport on your layout and then add your dimensions.

With AutoCAD Mechanical, you can just use the detail command, which automates both processes described above. After starting the command, you simply drag a circle or rectangular to determine the area for detail view creation. Next, you will be given plenty of options to control how you want to create your detail view, even with view labels (see Figures 11a and 11b).

Other features to discover

Mechanical calculators

Now that I am in the teaching business, I don't have to worry about doing any crazy formulas to make sure my part doesn't fail. Assuming you are better at math than I am, you might still like to be a little faster. Below are a few samples of AutoCAD Mechanical tools that can help.

The calculation toolbar can be accessed by right-clicking on any empty gray space next to a toolbar and selecting Mechanical. Some of these same tools can also be started by going to the Content pull down menu and selecting calculation from the menu.

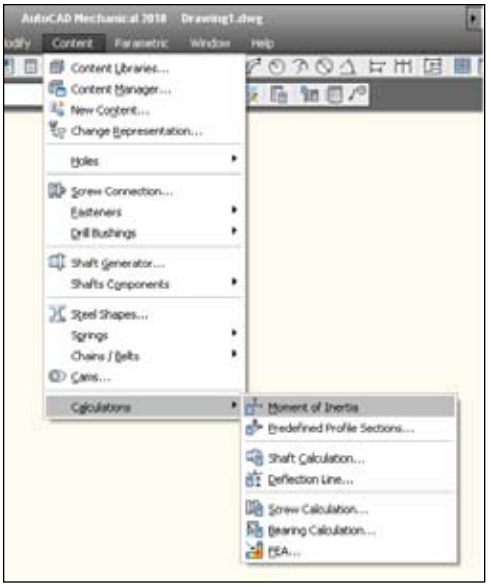


Figure 12

Inventor link

Some companies have customers, vendors, or other departments that use Autodesk Inventor®.

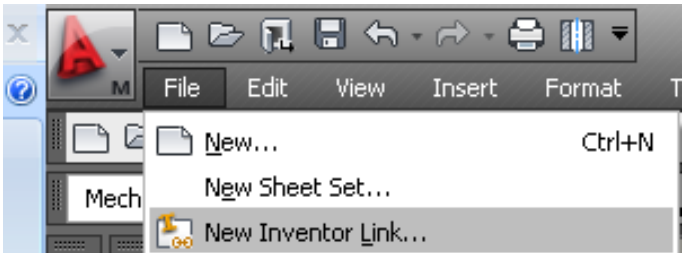


Figure 13

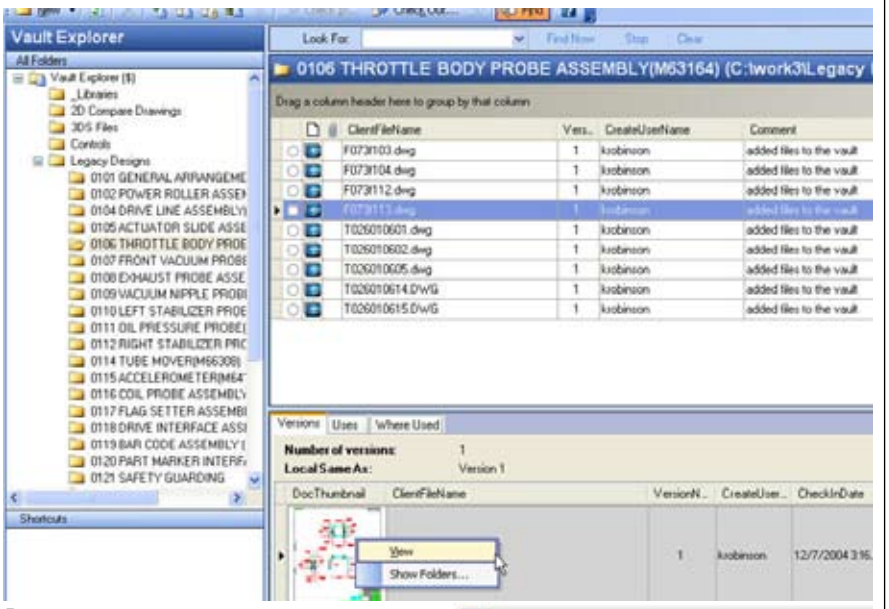


Figure 14a

The Inventor Link functionality allows AutoCAD Mechanical users to generate associative 2D view such as front, right, top, section, and detail from the 3D model. In case of a design change, all the views can be updated automatically.

Note: The Inventor Link option must be selected when prompted during the installation.

Autodesk Vault

Keeping track of Xrefs seems to be something at which architects excel. A few years back, Autodesk acquired some great technology that helps keep track of your files. This technology has now been transformed into Autodesk® Vault, which ships with AutoCAD Mechanical, AutoCAD Electrical, and Autodesk Inventor. Vault enables designers to instantly search thousands of files, check-in and check-out designs, and build attachments to other engineering related documents.

Note: Autodesk Vault is installed from a separate CD that comes with your software.

Summary

As you can see, AutoCAD Mechanical contains tools to instantly make you more productive with your mechanical drafting. In addition, features such as Calculators, Structure, and Autodesk Vault make AutoCAD Mechanical more than just a drafting tool.

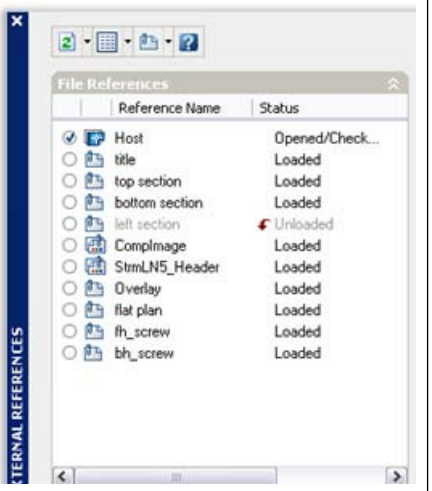


Figure 14a

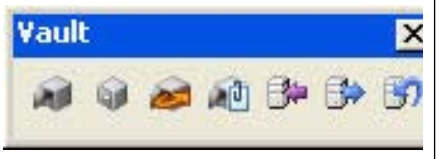


Figure 14c

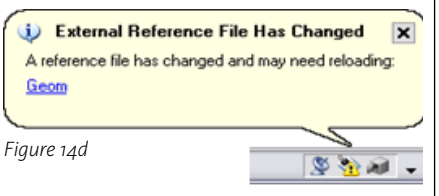


Figure 14d

Kevin Robinson has spent the last 14 years absorbing and applying CAD technology as an end user, CAD administrator, technical support / helpdesk, trainer, demo jock, and in marketing and sales engineering. Using his past experience, Kevin helps customers realize their potential by investing in technology and services to rollout solutions for their business needs.

5 Reasons to Use Vault with AutoCAD

With the 2010 release of Autodesk products, the Autodesk® Vault solutions are now more scalable, obtainable, and cost effective than ever before. Many of the new Vault capabilities are now particularly suited for use with AutoCAD® including innovative new methods for managing AutoCAD data including revisions, lifecycles, and property management.

The top 5 reasons to use Vault with AutoCAD are:

1. Better roll-out and upgrade path
2. Better out-of-the-box solution
3. Better security management
4. Better security and access control
5. Better CAD integration

Reason #1: Better Rollout and upgrade path

Installing and rolling out new software is daunting enough on the CAD level, but the complexities of data management only seem to compound the situation. If a CAD installation doesn't go quite as planned, there aren't typically any major downstream implications. With data management, however, a miscue in planning or configuration can lead to interruptions in company processes. If a system is installed, it can often take an act of Congress to switch or upgrade to another data management platform with additional capabilities.

The Autodesk Vault data management platform can be installed with just the core Vault components and upgraded later to one of the more advanced products. It requires only an upgrade to the Vault server software and rolling out new workstation client software. There isn't any complex migration of data from one environment to another. This makes the Vault platform appealing to companies that want to start simple and add capabilities to refine their processes in the future.

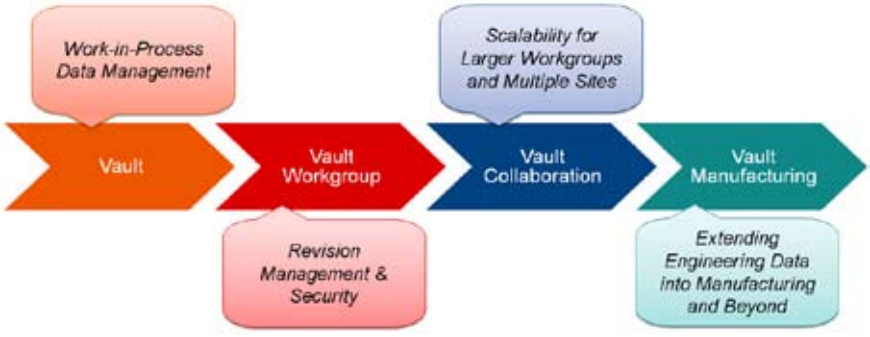


Figure 1: Vault upgrade path

Reason #2: Better out-of-the-box solution for AutoCAD

Data management systems for AutoCAD in the past have always been developed by third-party developers, which could sometimes lead to a variety of problems. Since

development was always reactionary to a new AutoCAD release, the release dates of data management systems for AutoCAD typically followed by several months and sometimes required additional testing and debugging before production use.

The data management systems I have worked with in the past were often overly complex and required extensive customization. This customization often added extra bells and whistles to take automation to the next level, but this also locked the company into that version of AutoCAD due to the extensive custom programming required to migrate from one release to the next.

The Vault solutions already cover a core set of typical requirements that don't require custom programming. This allows for an easier transition to new releases of AutoCAD.

Vault is laid out a lot like a Microsoft Outlook interface. A folder structure is displayed on the upper left, with a shortcuts listed below it. In the upper right is the list of files. All of the file information is listed below the file list, much like the preview pane in Microsoft Outlook. This familiar interface makes learning and using the Vault more intuitive than some "card"-based systems. All of the relevant information is at your fingertips rather than trying to duplicate the old library type system using a drawing card catalog.

Reason #3: Better security management

Better security management improvements to Vault 2010 include managing file revisions, lifecycle states, user-defined properties, and categories.

Manage file revisions

- Record, review, and retrieve revision history directly on files.
- Control consumption of new revisions by parent files.
- Import or configure custom revision schemes.
- Easily synchronize revision values with file properties.

With Vault Workgroup and higher, you can capture revision history of your vaulted data, making audit and tracking tasks easy as you make continuous improvement to your designs. Further, you reduce the chances for design and manufacturing errors by applying security to the data revisions, granting access to the "correct" revision of a design to those who need it. The revision control in Vault is tightly integrated with the lifecycle-based security. A document's revision can be controlled manually or through the lifecycle of the document. The lifecycle can determine exactly when a revision is incremented such as when a document is transitioned from a "released" state to one that is "work in process."

Lifecycle state security

- Identify status of files in the form of "lifecycle states."
- Create and customize multiple lifecycle definitions.
- Configure file security based on lifecycle state.

Vault allows you to control the critical aspects of design data as it graduates through its stages of development, ensuring that people get access to the correct data at the right time. By applying lifecycle states directly on files, the file security can be predefined for the state transition, providing an advanced set of access control.

As an example, let's assume a file is in an early stage of development and we could call it "work in process." At this point, it isn't appropriate for anyone outside engineering to view or print the file, so they would be denied any level of file access at that time.

When engineering completes the drawing and marks it as "released," an entirely different set of permissions can automatically take effect. Now the manufacturing personnel and others can view the file but not change it. In addition, editing rights can be denied to engineering until the appropriate manager moves the file back to a "work in process" state again. This can prevent unintended engineering modifications without approval.

User-defined properties

- Append additional property information to files.
- Review properties through a new properties tab.
- Easily write back property values to files.
- Promote company standardization with property policies on files.

Autodesk Vault now allows users to capture and manage extended information with design files that are not captured on your drawings. These user-defined properties appear on a new properties tab, making it easy to manage and review. Further, property policies and write back now work directly on files, helping reduce errors and rework by allowing the designers to synchronize properties with files and conform to standards before submitting their designs for review.

Categories

- Automate security settings assignment.
- Reduce time to apply and manage security.
- Purpose-based security management.

Categories allow you to define unique buckets for documents that can have their own unique configuration of lifecycle, revision, and properties. Once a document is assigned a category, the correct combination of lifecycle, revision, and properties is already defined for it. In practice, this allows us to control exactly how the document is handled within our company processes.

For example, we might have a category of drawings that is only for engineering and design consumption, so the manufacturing floor and other people viewing wouldn't be able to access the engineering drawings. Another category might be for the production drawings that would also be accessible by manufacturing and all the other drawing consumers throughout the company.

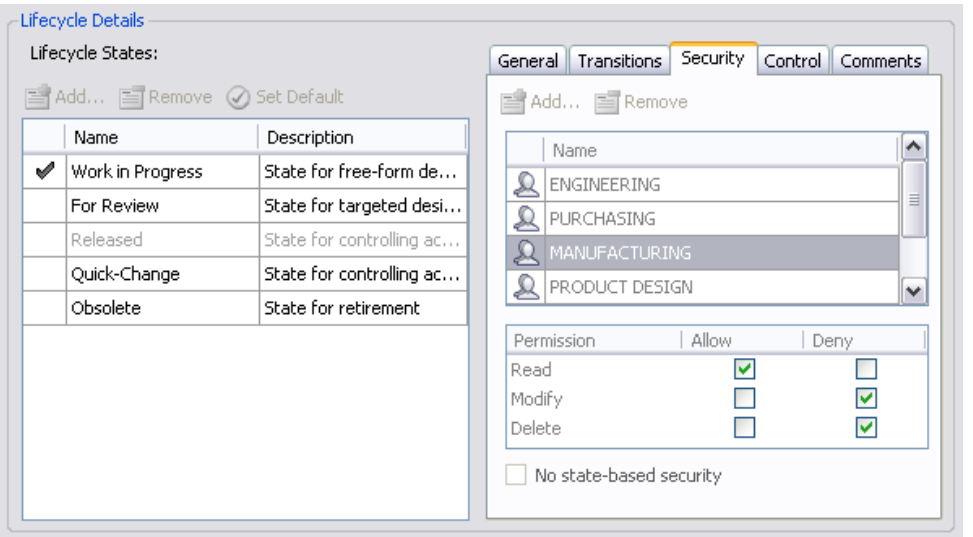


Figure 2: Vault lifecycle security

Applying a category to a document is as simple as knowing the documents' purpose. All of the security details are then carried through to the document without users needing to understand all the detailed configurations involved in the security model.

Reason #4: Better CAD integration

The Vault 2010 products include better CAD integration features such as Automatic File Naming, Revision Management directly within AutoCAD, Title Block Synchronization, and updates to the user interface within AutoCAD.

Now with Autodesk Vault Manufacturing, users are enabled to stay in their design environment. Tools have been directly integrated and enhanced within the design application, such as automatic file naming, where used, change state, and revise. This means users can take care of their Vaulting tasks without having to switch to other applications and becoming distracted with other tools.

Reserve and assign unique files names from a pre-defined scheme

- Define and promote company numbering standards.
- Reduce accidental file duplication and related errors.
- Applies on file "save" operations as well as "save as."

Users can now create new design files and have Autodesk Vault automatically assign file names without having to leave the design application! Simply define your company numbering standard and Vault can automatically name files upon saving them. This can eliminate extra records in Microsoft Excel or physical logbooks previously required to keep track of which numbers had already been used and which are still available.

Track and manage revisions of vaulted design files directly within AutoCAD

- Quickly understand the status of a design with the enhanced browser.
- Stay focused on your design while controlling its state in the window.
- Easily open and place the revision you need for your design.

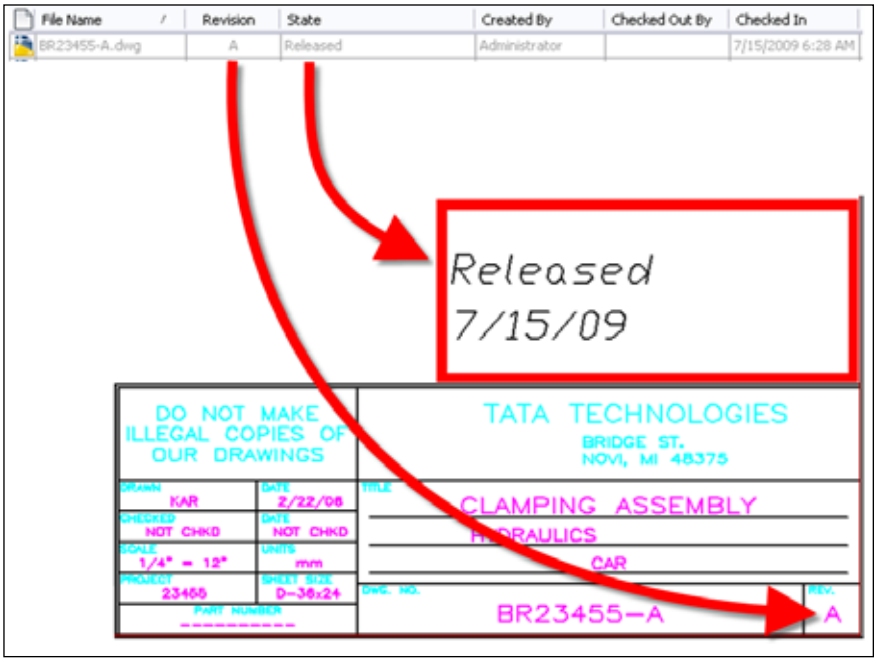


Figure 4: Lifecycle and Property Linking

Now designers can track and manage the revisions of their design files directly within CAD. The Xref browser has been enhanced to report the lifecycle state and revision of each design file. Further, users now have the ability to open and place specific revisions of a design rather than the 'latest' version. This gives users more control over when to consume a new revision of a design file.

Users can take care of their Vaulting tasks without having to switch to other applications and becoming distracted with other tools

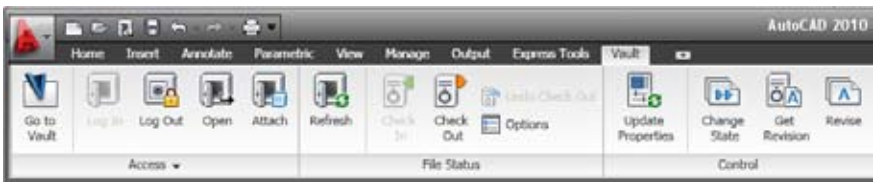


Figure 3: Vault control toolbar

Automatically exchange data between Vault and AutoCAD title blocks

- Extract title block attributes into Vault properties.
- Populate Vault user properties into AutoCAD block attributes.

Reason #5: Better user productivity

The Vault 2010 products include better user productivity tools such as Job Server, non-CAD integration improvements, configurable search views, and batch plotting that all improve the user experience.

Offload visualization file publishing (DWF) using Job Server queue

- Increase file check-in and user performance by offloading visualization publishing.
- Dedicate a workstation to publish all user jobs.
- Increase workstation ROI by publishing during downtime.

Publishing visualization files for designs takes time and can slow the release process for large sets of drawings. With Autodesk Vault Collaboration, users can offload this action to the new job server to speed check-in times and ensure lightweight viewable availability. You can also take advantage of engineering workstations during downtime (overnight, for example) to publish visualization files with the job server.

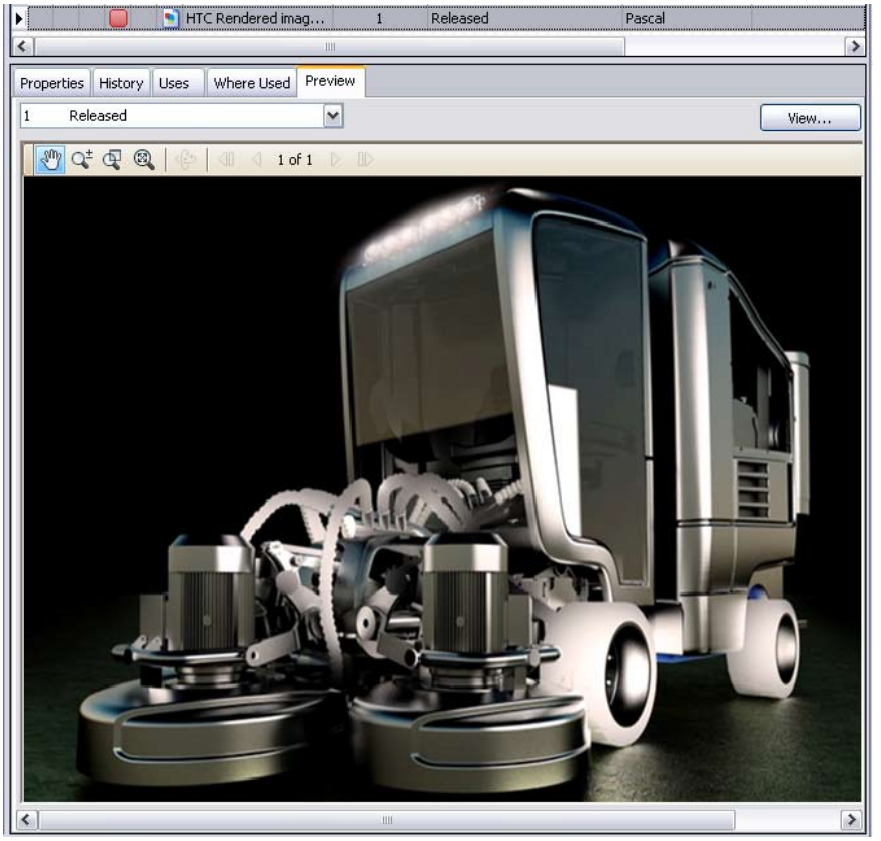


Figure 5: Image viewing

Improved support for non-CAD Vaulting needs

- Integrated viewing of raster images including GIF, TIF, BMP, JPG, and PNG.
- Copy of non-CAD files within Vault; no need to leave the vaulted environment.
- Improved Microsoft Office add-ins with high-quality, consistent keyboard shortcuts, and support for templates.

The Vaulting experience has been improved for non-designing team members as well. The office integration quality is much improved and more closely integrated. Further, users can now copy more than design files within the Vault. Files such as Word documents can be copied directly in the Vault, much like how it is done within Windows Explorer, without ever having to leave the Vault. Finally, the preview tab now disiplays image files, too, which means that all of those scanned .tiff drawings can be viewed in Vault right along with the AutoCAD drawings.

Combination of basic, advanced, and saved search views

- Simple searching.
- Advanced unique searches.
- Advanced searches can be saved to display in search folders.

The wide array of searching techniques in Vault makes finding, sorting, and viewing of file data easy in a variety of situations. The simple search can be used at a moment's notice while the advanced Find command can narrow results down to very specific results based on a file's attribute or property information. Searches using the advanced Find command can also be saved as search folders for fast location and viewing of all files meeting the search criteria.

The Vault 2010 product line has changed the landscape of data management as it pertains to AutoCAD

Manage plots sets with confidence

- Plot sets saved for future use.
- Add more sheets as needed.
- Always allows plotting of latest revision.
- Page setup management is built-in

Vault's plot manager allows a simple environment for preparing, configuring, saving, and retrieving plot sets. The plot manager is also "revision aware," so as to avoid costly mistakes associated with plotting old revisions or designs undergoing change. The plot manager automatically recognizes when a new revision is released, ensuring that all plotted materials are up to date and allowing plot sets to be easily maintained.

Summary

In summary, the Vault 2010 product line has changed the landscape of data management as it pertains to AutoCAD.

The Vault solutions offer a better rollout and upgrade path than solutions in the past, and Autodesk's concurrent development of the CAD and data management products ensures the smoothest deployments. In addition, there is a seamless upgrade path for companies interested in additional future functionality.

- The Vault solution is an excellent out-of-the-box solution for AutoCAD users and doesn't require extensive custom coding or customization that needs to be updated with each release.
- Vault also now includes straightforward lifecycle and revision management tools that allow your company to communicate the right data, at the right time, to the right people.
- Vault has the best integration with AutoCAD. Management tools built into the CAD environment minimize the distraction of a second window for file management.
- Vault offers better user productivity with tools such as the Plot Manager for managing plot sets, and Job Server for offloading visualization file publishing.

Ben Curtin has used various CAD applications since 1993 and holds a BSME from Michigan Technological University. Previous industry experience includes working at a machine tool manufacturer and a furniture manufacturer as a product development engineer where he used AutoCAD, Inventor, and Vault. With more than 10 years experience using Autodesk's manufacturing products in a technical consulting role, Ben currently works for Tata Technologies as a business development consultant.

Why Should I Buy a CAD Graphics Card?

Being involved in with AutoCAD® Civil 3D and Autodesk Inventor®, I occasionally run headlong into the video subject. During the course of researching a "best fit" laptop recently, I dredged up the age-old question. Is there a graphics card that will span the gap and do it all? Yes, shopping often turns into a research project of untold proportion. My wife does not appreciate it.

Today's graphics cards are expected to handle a great deal of "completing" the final image that is displayed. Processes such as texture and lighting are handed off to the card to complete on its own. There are two types of applications driving the video market today: games and scientific/design applications.

The mainstream market moves with the largest group of consumers—those in general computing, gaming, and imaging. These applications look to the video card to perform miracles that involve rendering scene after scene of animation or delivering large image data to numerous monitors.

Applications such as AutoCAD®, however, are entrenched in polygon geometry and not so much rendered scenery. This has created a huge gap in the coverage of video cards. The mainstream market constantly demands more intense shading and realism to which graphics cards can gravitate—a direction in which the manufacturer AMD, maker of the ATI family of products, has performed well recently.

I need a card that can do everything. My roles are diverse and I need a card that is capable in all camps. Perhaps a bit better in one than the other, but a solid 80 percent across the board.

Video API

OpenGL and Direct X are the delivery options to get your video to the display. If you think of the graphics card like a manufacturer's "finishing house," then the video API is the service that delivers the product and specs to the finishing house.

Direct X is the Windows API that is everywhere. It is easy to use. Just adapt your application to use it and the delivery service will package your half-completed product, write out the specs, and deliver it to the finishing house. The finishing house then sends your product, detailed as specified, straight to market (the display)—"Fire and Forget" graphics.

The downside is that while Direct X is emerging as a capable API, our applications have historically used OpenGL. If our analogy of Direct X were true, the service reps would come in compact delivery trucks wearing business suits and always drive the product over the same path as management (or Windows) dictated. No worries.

OpenGL guys would be thick-necked truckers backing in a huge rig. There is little management, and no real way to know which rep will drive which truck. They'll get it there, and do a beautiful job of it, but sometimes the finishing house guys don't like the driver of the truck and subsequently will run your video product through the shredder.

It's not that anything in the OpenGL code or the video card is bad. In fact, quite the contrary. However, as new cards are released from the manufacturers and the applications put more strain on the API, things don't always connect properly. The API is not managed in a rigid cast; subsequently, things are permitted in OpenGL that this graphics card or that revision just can't manage. So Autodesk spends tons of money trying to get their OpenGL structure stable for every type of application and machine setup.

Design graphics cards

Manufacturers NVIDIA and AMD (ATI) produce video cards in two major forms. One is a mainstream card and the other is the design card (aka, the "CAD card"). For NVIDIA, the design card is the Quadro; for ATI it's FireGL. The Mainstream cards are Direct X tuned and capable of delivering a huge array of shaded pixels at a mind numbing rate. Polygons, well not so much.

Figure 1

The CAD cards are built on the research and development of the mainstream cards. Specialized OpenGL drivers are then adapted to the mainstream GPUs, and sometimes better RAM and features are applied to the card as well. While not stated by the manufacturer, some video experts indicate that certain CAD and the mainstream cards are identical, except for bios revisions to use the appropriate design/OpenGL driver. This combination produces a very efficient method of dealing with complex design models. These companies spend a great deal of time conferring with Autodesk and the like to get a capable and stable OpenGL driver for each of its CAD cards. This process ensures a capable price tag as well.

For example, NVIDIA's Quadro FX 5600 is built on the G80 GPU—the same GPU as the GeForce 8800 series. The Quadro FX 1700 is built on the G84 GPU, the same as the GeForce 8600 series. The similar situation happens in the ATI camps as well.

In November 2008, NVIDIA released the Quadro FX 5800 at $3,500 USD. It is built on the same GT200 GPU as the smokin' GTX 280. You can pick up the 280 for $500 USD right now. There does seem to be disproportionate pricing.

The cards priced as midrange are built on vehicles that are a few years old. The Quadro FX 3700, a commonly supplied design card, is built on the G92 GPU architecture found in the very capable GeForce 9800 GT, an architecture that was introduced in 2007. The Quadro FX 3700 is priced at $600 USD.

CAD cards often come with more RAM than the mainstream models. This is good, but there is a point where the processor is not fast enough to fill so much RAM, leaving much unused. Discussions noted that VRAM should be sized directly proportionate to the resolution of the display. Resolutions of up to 1200 x 1900 tend to do fine with half-gig of VRAM.

The CAD card discussion

Go on ANY video forum, search for CAD, and you will find the following statement:

"If you are doing CAD work, get a CAD card. Otherwise, get a mainstream card."

The question is asked over and over again. Why? Because CAD cards are unbelievably expensive, and for what? Wait for the exacting answer and you will usually get vague responses about crispness and performance.

Obstinance leads to research

I'm obstinate. The people who learn easily understand that telling me "that's just the way it is" without being able to back it up with something better than "it has always been that way" will put me on a quest that ends up with me returning to their office with a sarcastic grin on my face.

I began digging into CAD and mainstream articles and forum discussions. The problem was that, on one hand, you have reports and reviews of similar-use cards that never reach beyond the common use. On the other hand, the discussions point out the differences between the CAD and mainstream cards, but offer no real way to understand how those differences affect me.

I did find separate articles that used SPECViewperf to test the OpenGL performance on the mainstream and CAD cards separately. I compared the results and it was not a pretty sight. The CAD cards tested were five times faster than the mainstream cards. Scripted benchmarks are okay, but I want actual software tested.

I finally came upon a test from X-Bit Laboratories titled "Roundup: Professional Graphics Accelerators from the Mid-Range Segment." It contained tests of popular CAD cards from both camps, with one substantial and exciting difference: they threw a popular mainstream card into the mix. Oooh..

The test pitted the NVIDIA Quadro FX 570, 1700, and 3700 against the ATI FirePro 3600, 5600, 7600, and 8600 cards. The GeForce 9800 GTX was the fly in the ointment. The benchmark results indicated that in 80 percent of the scripted tests, the mainstream card was five times slower; when the anti-aliasing was applied, well it was a bit disappointing, but I guess you get what you pay for.

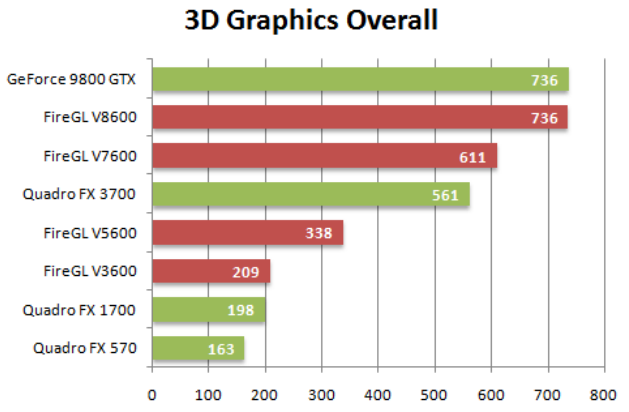


Figure 2

Fortunately I read the following at the end of the anti-aliasing section:

> *"…[SPECviewprf] still uses almost 5-year-old model of applications behavior. Moreover, do not forget about the ever growing tendency to transfer professional applications from OpenGL to DirectX that can currently offer more options, especially when it comes to shader processing. For example, Microsoft API is already moving into 3ds Max and AutoCAD, which is not taken into account by the benchmark. Therefore, SPECviewperf tests cannot really replace real professional applications that we are going to talk about next."*

Now that's interesting. The following tests ran the array of CAD cards through numerous tests in actual programs, including AutoCAD 2009, that were both polygon and shader intensive. The result was fairly clear.

- ATI cards are shader-heavy, permitting the FireGL to perform better in the lighting and texture arenas.
- NVIDIA card architecture treats polygons substantially better, allowing heavy model geometry to be more efficiently handled by the Quadro.
- The mainstream NVIDIA GeForce card held its own and surpassed 80 percent of the cards in many tests.

The AutoCAD 2009 test was divided into these categories: 3D Overall Graphics, Wireframe Graphics, Flat Shade Graphics, and Gourand Shade Graphics.

In the flat shade test, the mainstream card came in second only to the FireGL v8600.

In the rest of the tests the GeForce 9800 GTX smoked them all!

Leaning away from OpenGL?

Due to the OpenGL API issues we discussed, many companies are spending their research dollars researching ways to effectively use the Direct X API for their applications. Why not? It's not going anywhere and it is stable. Adapting to the platform would allow a good portion of your R&D to be leveraged elsewhere. Video anomalies would appear in a substantially lower number of users, making the clean-up even faster.

Dennis Jeffrey, founder of Tekni Consulting LLC, reminded me that Windows Vista only supports OpenGL software and the upcoming Windows 7 only supports Direct X. Where will that leave OpenGL?

Continuing on, I found an article on the Autodesk Inventor Discussion Group discussing the nature of OpenGL and the future at Autodesk. It goes on to discuss the limitations using 1997 based OpenGL code and the fact that if the video card is certified with Direct X, then it is good as far as any video transfer is concerned. Here is another tidbit:

> *"In addition, Direct3D is WHQL certified on a wide range of graphics HW, meaning workstation, consumer, game, laptop, and integrated-on-the-motherboard graph-*

ics chipsets. Essentially, using Direct3D, the only differentiator is performance. This is not true with OpenGL, where OpenGL graphics drivers actually disable some OpenGL functionality on consumer, game, laptop, and chipset HW so you are forced to purchase the more expensive workstation graphics HW, just so your OpenGL graphics works correctly."

Well, isn't that interesting?

Hardware certification

All the results from all the testing I mentioned that Autodesk performs ends up in the hardware section. Each card is tested on numerous platforms against an array of criteria. How it conforms and any notes are then put in a legend. I looked for the card I had in mind and found that its Direct X 10 certifications were solid in EVERY category—polygon display as well.

Verification

While the information compiled would create a compelling report, I felt uneasy without first performing a comparison myself. Graham Harris, an Inventor professional, was quite happy to allow me to run some mild tests on both Inventor 2010 and AutoCAD Civil 3D 2010 using his mainstream setup.

The test beds were not exactly matched, but we do the best we can. Graham's machine was an ASUS-based AMD FX60 939 (2.6 Ghz), 2GB memory, Velociraptor 10,000 RPM HD, a Dell 24 LCD pushed by a NVIDIA GeForce 7900 GTX.

My contribution was a Dell M65 Laptop, Intel T2500 (2.0 Ghz), 3+ GB memory, Hitachi 5400 RPM HD, 15" Laptop LCD pushed by an NVIDIA Quadro FX350M. (Don't laugh; I can do wonders with that little old card!)

The tests were simple. Open a couple files, visually inspect key aspects, speed, and reliability of the display. I was concerned about using 3+ year old hardware for the evaluation, but I realized that if old components could get through this, imagine what new DX10 hardware could do.

Civil 3D/Quadro: Using OpenGL, the polygons were perfect, anti-aliasing was performed properly, and the meshes were beautiful. The colors were a bit subdued. The orbited shaded surfaces were well behaved in both model space and the object viewer. The TIN surface display was dominated by triangles and the texture was not visible in shaded view. Rendering was great.

Civil 3D/GeForce: On Direct X 9, the colors were quite vivid. The polygons highlighted perfectly, a historical concern. The panning rate of a large surface mesh was not quite as fast as the Quadro. It still performed quite well considering the WS had half the RAM. The anti-aliasing was not quite as good as the Quadro, but still nice. The surface texture dominates the model in the shaded view; perhaps a bit much. Rendering was great.

Autodesk Inventor: There were no differences between machines. None. Highlighting from the model browser was flawless, ¾ views were clear, and speed was fabulous as well. Rendering was 50 percent faster on the GeForce machine (but processor speed might have helped).

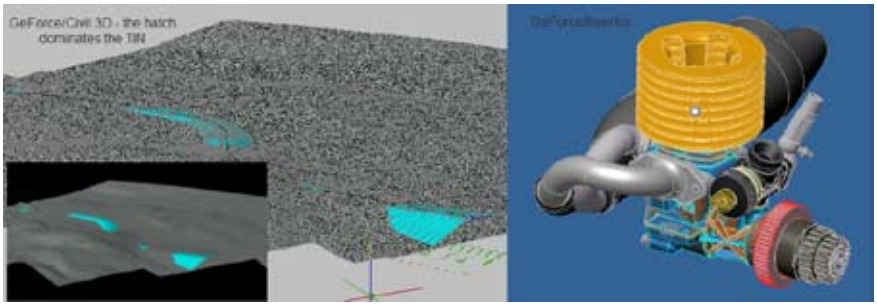


Figure 3: Quadro output

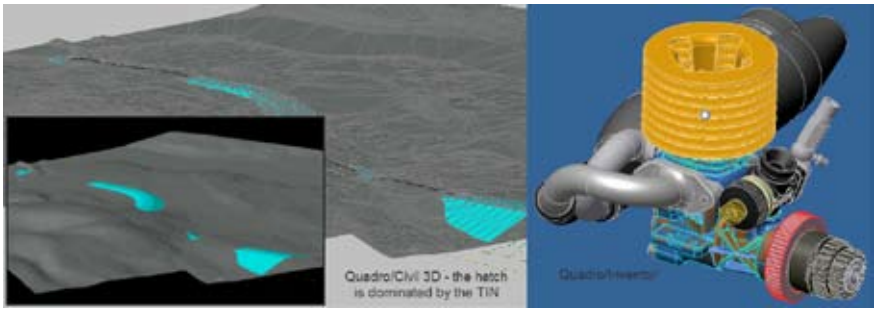


Figure 3: GeForce output

Conclusion

Considering that the CAD cards are based on their mainstream counterparts, the CAD card is the best of both worlds. It has both Direct X and OpenGL tuning. Some still argue that CAD cards won't do Direct X things well.

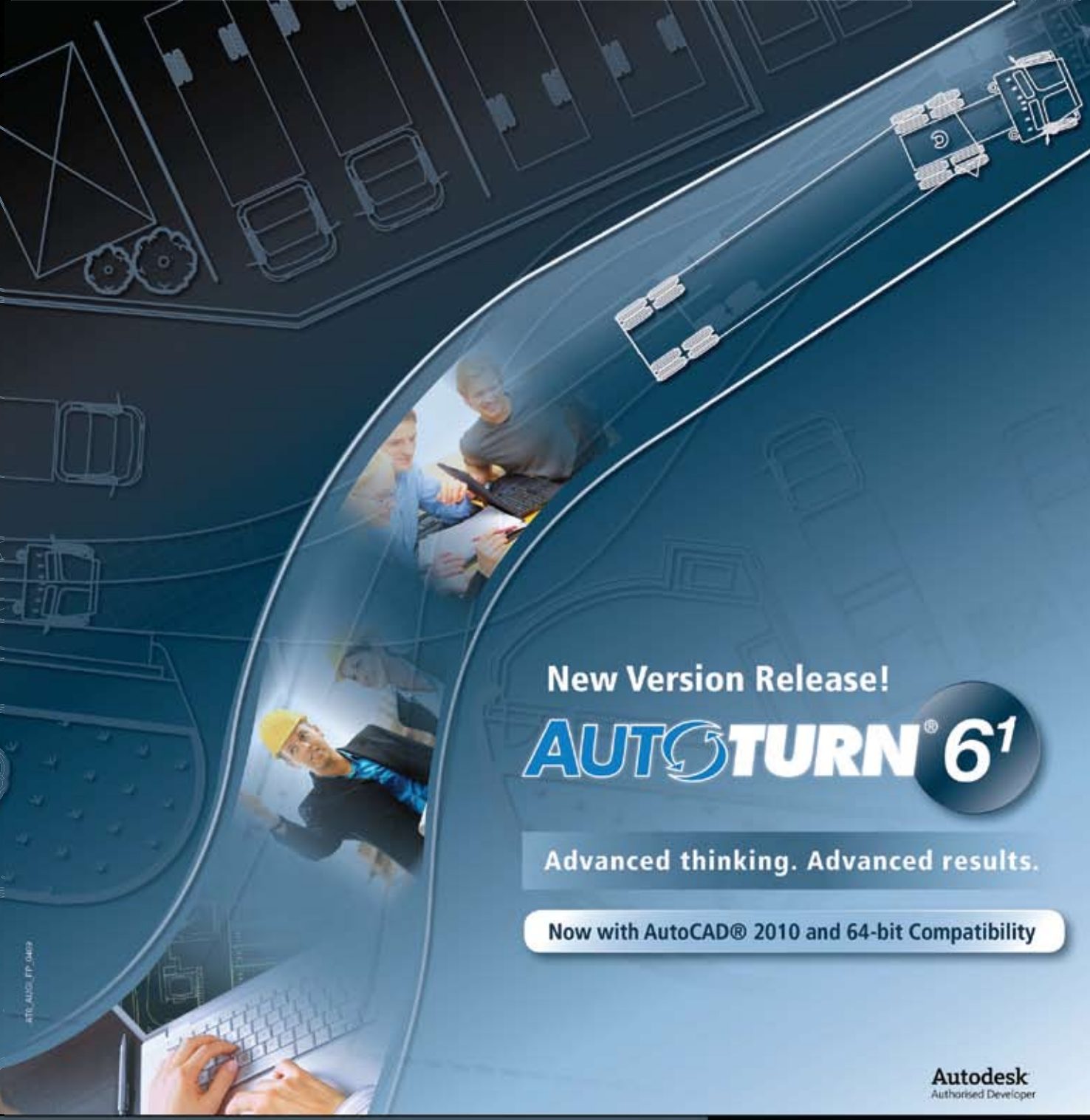
It's not because CAD cards are tuned for OpenGL. The truth is that is because the cards that the majority of people are using are old technology pitted against new powerful applications. You just bought a brand-new laptop with 3-year-old video card technology and wonder why some things outside of AutoCAD just won't perform. AutoCAD is still using 1997 OpenGL code, so it should not be a surprise that the old CAD cards still perform wonders… in AutoCAD.

The rub is how new and efficient a graphics technology can you afford? CAD cards built on brand new GPUs are incredible across the board, but do you have $3,500 to spend on a graphics card when the mainstream hammer is only $600?

If I had all the money in the world, then I'd be purchasing a Quadro FX 5800. It is built on an awesome mainstream technology, and with tuned OpenGL, I could not lose. If my company replaced my aged laptop with a new one containing the older Quadro FX 3700, I'd be ecstatic. Really.

But if I have to put together something out of what is left from my family's funds, then it smells like a smoking fast GeForce card. Autodesk plainly stating that it is moving forward with Direct X creates a huge problem for companies that are considering buying computers in the near future, and gives new meaning to the question "Why should I buy a CAD graphics card?"

John Evans is an Autodesk Civil 3D and Inventor Certified Professional. John works as a CAD manager for a Civil Engineering firm in the Florida panhandle and has been involved in Civil Engineering since he started in the field in 1992. A troubleshooting consultant for Civil 3D and Inventor with a large background in Civil Engineering, aviation, and manufacturing, he writes solution articles on the blog "From Civil to inventor." John is a contributing author on Web-based training and courseware development at Tekni Consulting LLC. A new book, Creative Design with Autodesk Inventor, *is currently in production for late fall 2009 delivery. He can be reached by email at: civil2inventor@cox.net*



AutoTURN 6.1 – the latest version of the world's most popular vehicle turn simulation and swept path analysis CAD software – is now available.

Everyday, engineers and architects from government agencies and major consulting firms use AutoTURN to analyze and evaluate vehicle maneuvers for projects such as intersections, roundabouts, bus terminals, loading bays or any off-street assignments involving access, clearance, and maneuverability checks.

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Residential Wood Trusses in Revit Structure 2010

BIM (Building Information Modeling) is finally a reality and gaining traction in the residential homebuilder sector.

The residential wood truss business is software-driven at the truss plant level, where pre-manufactured trusses are created and then delivered to the job site. A residential wood truss comprises steel plated wood connections, top and bottom chords, and a configured web design to optimize the engineered strength of the wood truss.

Autodesk® Revit® Structure 2010 comes with many standard shape truss configurations as family types, which are available to use right after installing Revit Structure.

The family editor is an easy-to-use interface to create custom truss profiles. The truss profiles you create can be used to produce wood trusses inside your Revit model. They can be used for material takeoffs; they can be part of your structural analytical model; they can be used for clash detection.

In the not-so-distant future I foresee some of the main software companies that drive truss plants developing an interface inside the Revit environment. They will at least be able to access the BIM data from the Revit Structure trusses to be utilized in their software.

What does this mean to the residential architect / home builder / engineer?

In my opinion the introduction to BIM technology is real and the future trend in this industry.

Imagine a BIM model which contains the truss information that was value engineered inside of Revit Structure. The truss profiles are uniquely designed to allow for efficiencies in the mechanical, electrical, and plumbing (MEP) system layouts.

Truss Profiles exported from your Revit Structure Model can then be used by the Truss plant for component engineering and production. The end result to the builder is construction efficiencies, fewer site fixes, and controlled cost.

Create a custom truss

A truss family inside Revit Structure is made from analytical lines representing the top chord, bottom chord, and webbing, as shown in Figure 1.

STEP ONE: Create truss profile

Open a truss family to edit the truss profile or do a "Save as…" to create your own. Once you are in the truss family, Revit Structure provides you with sketching tools to lay out your design. It is important that you use the appropriate tools when drawing your top chord, bottom chord, or web configuration. See Figure 2.

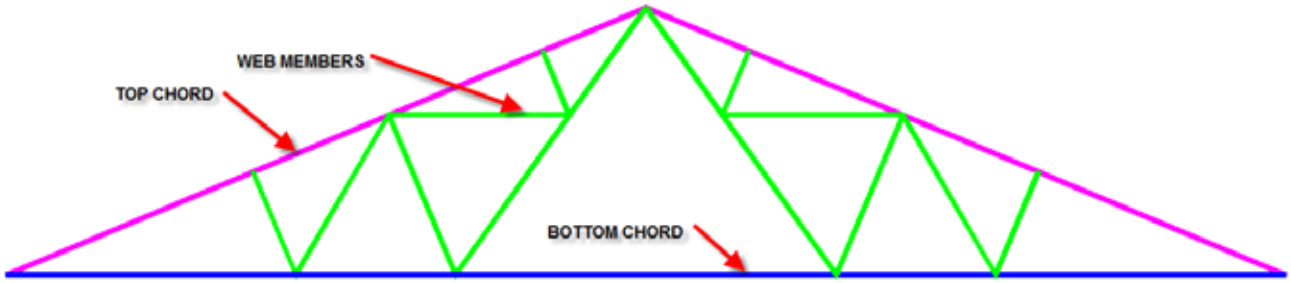

Figure 1: Fink truss family

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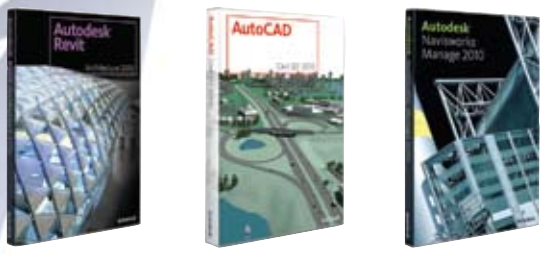

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- John Volk
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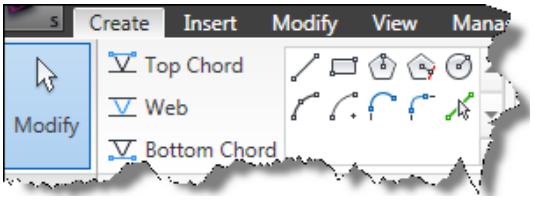

Figure 2: Truss sketching tools

STEP TWO: Load family and framing members

After your truss profile is created, select "load into project." This truss profile is now available for you to use with the truss tool; however, you will also need to load your framing members into your project as well.

After you load in the framing members you can assign them to the various components of your truss.

Loading framing members

To load in your framing members, select "load family" and then browse to your Imperial library\Structural\Framing\Wood folder. In this folder, you will load the dimensional lumber family and select the lumber sizes you need for your truss design. See Figure 3.

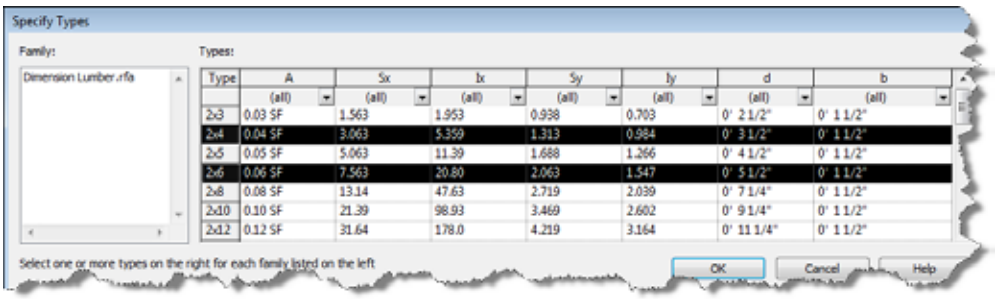

Figure 3: Dimensional lumber family

Assigning members

The last step in creating your custom wood truss is to assign the dimensional lumber to your truss. Open up the type properties of your truss as shown in Figure 4.

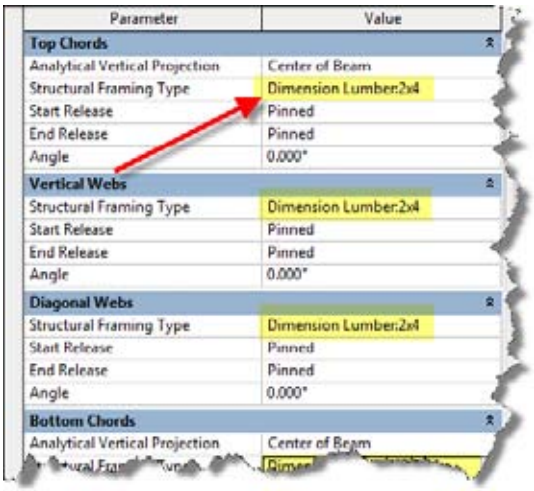

Figure 4: Truss family type properties

Framing elevation

Now that we have a custom wood truss profile created and placed in our drawing, we can generate framing elevations. From the framing elevation, we can dimension each unique truss and provide data for the truss companies to follow. See Figure 5.

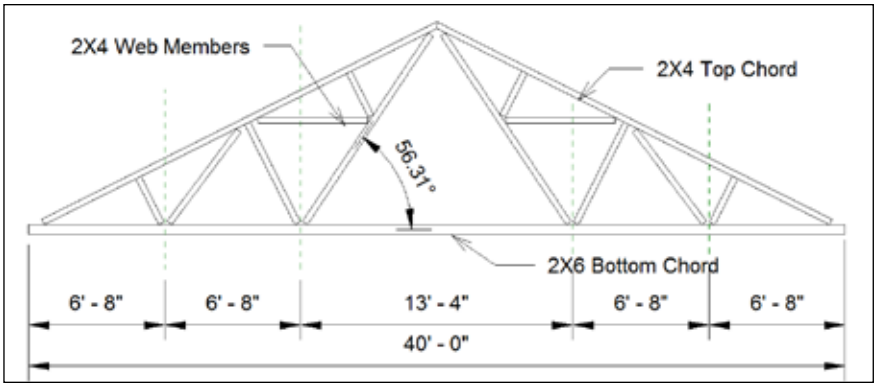

Figure 5: Truss framing elevation

Possibilities

In my opinion we are not far away from the truss plants being able to leverage this data from the Revit Structure BIM model.

Revit Structure builds an analytical model that already can be exported to structural analysis software such as RISA or ADAPT. So now the truss layouts and designs become part of the design process for the rest of the structure.

With trusses in place, the MEP systems can be more accurately designed. More accurate designs will lead to more accurate material takeoffs. More accurate material takeoffs leads to more accurate construction cost budgeting.

Industry news

Leading wood truss software companies such as Keymark, Alpine, and Mitek have interfaces with Autodesk's AutoCAD® Architecture and are nearing completion of a Revit interface. This will allow a more fluid transition from design drawings to shop drawings.

A truly efficient interface would allow for "round tripping," where changes made at the shop-drawing level could find their way back to the design documents automatically, and vice versa. That feature however, will not be ready for some time to come.

Phil Russo began with AutoCAD version 2.5 in 1986. Through the years, he has held positions in the CAD industry as CAD draftsman, CAD manager, applications engineer, and Autodesk Certified Instructor. Lately Phil's focus has been on the development and implementation of standard practices for the Autodesk Revit product line including Revit Architecture, Revit Structure, and Revit MEP. He currently works at Linderman Bentzon Bojack, an architectural and engineering firm located in Clermont, Florida. He can be reached at philr@lbbe.com.

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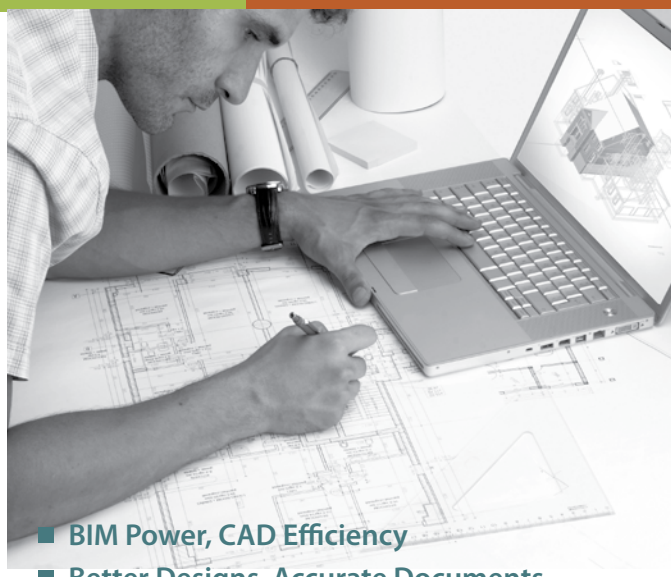

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– Dr. Lachmi Khemlani, AECBytes.com

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