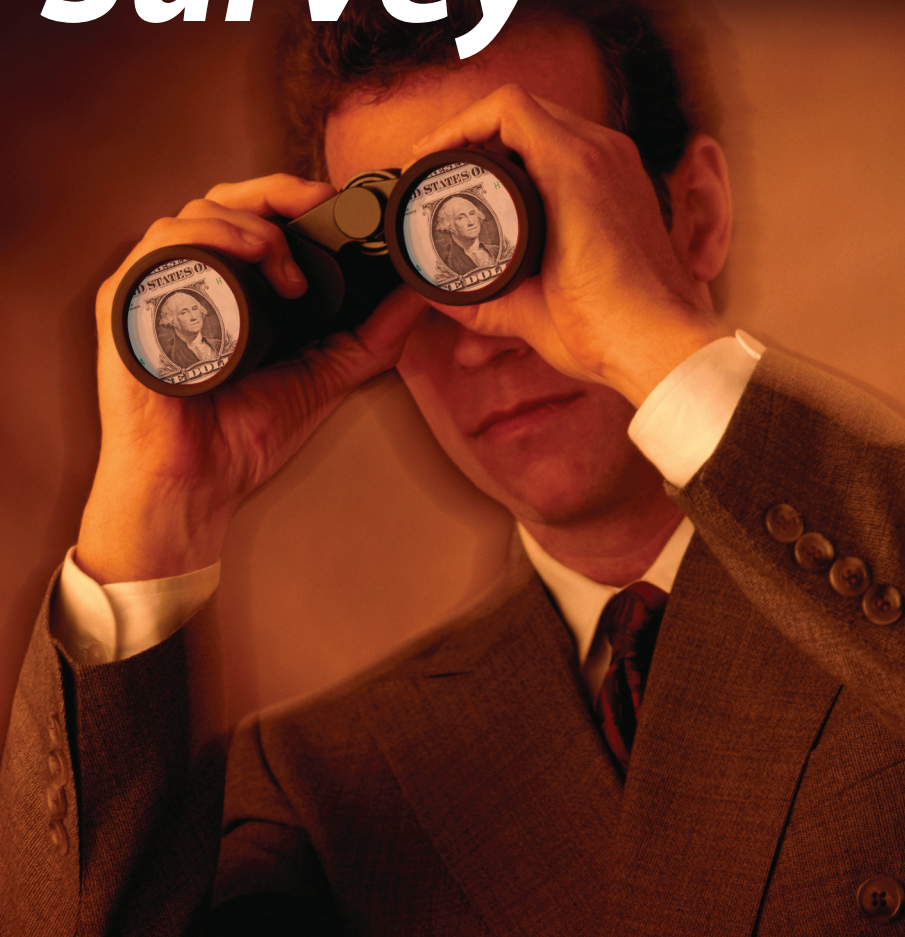




# AUGIWorld

The Official Publication of Autodesk User Group International

## *CAD Salary Survey*



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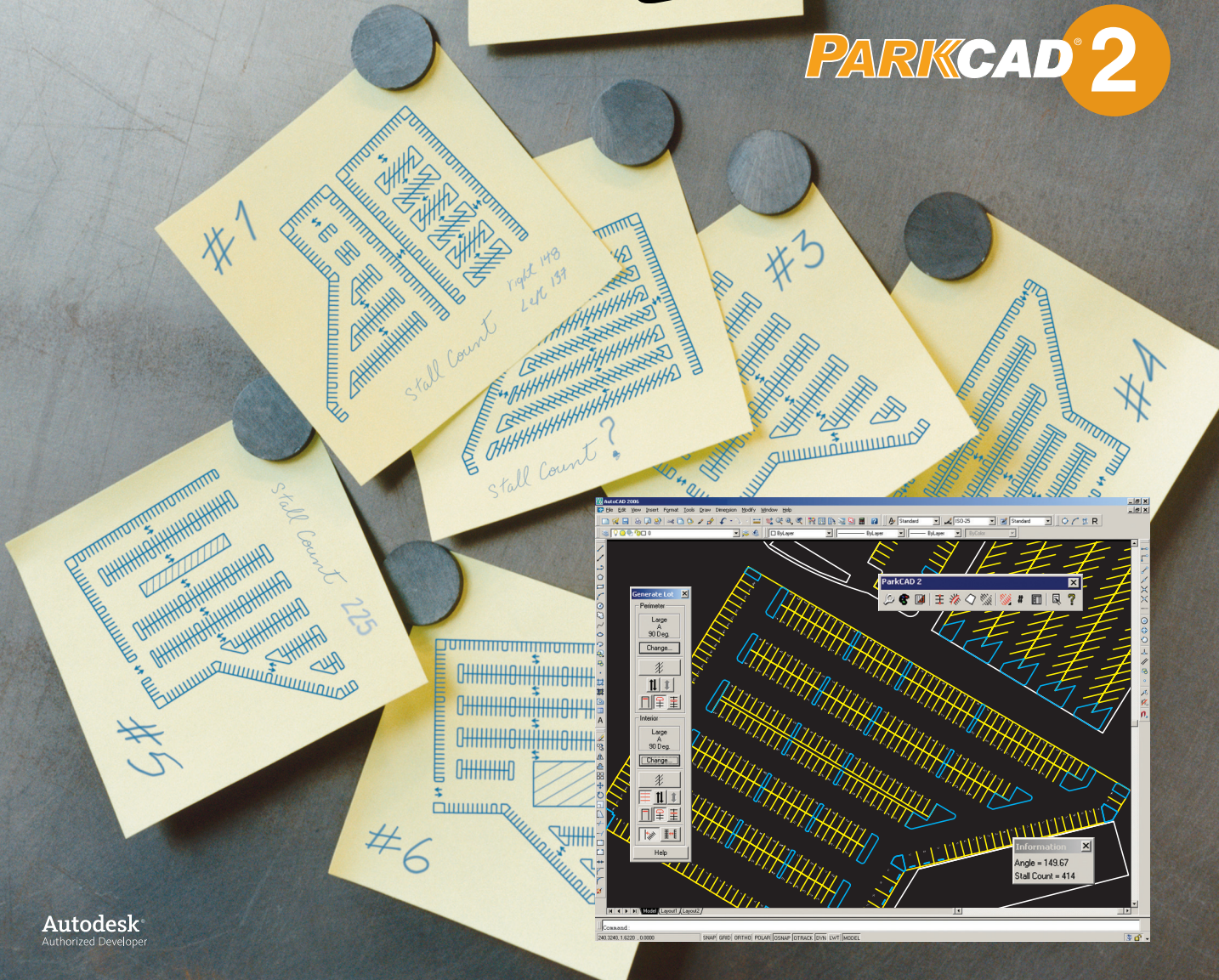
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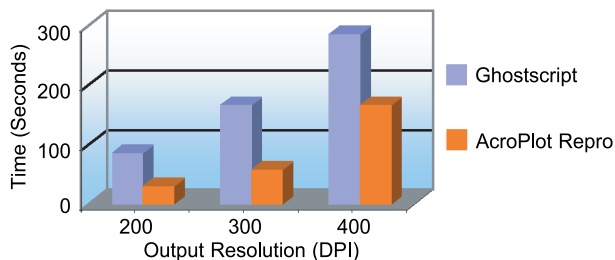
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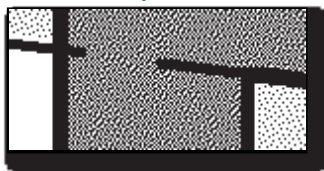


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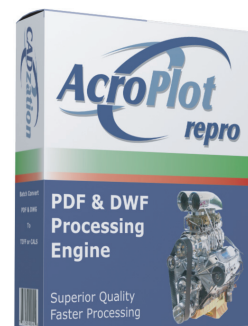
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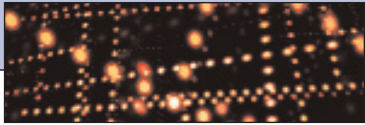
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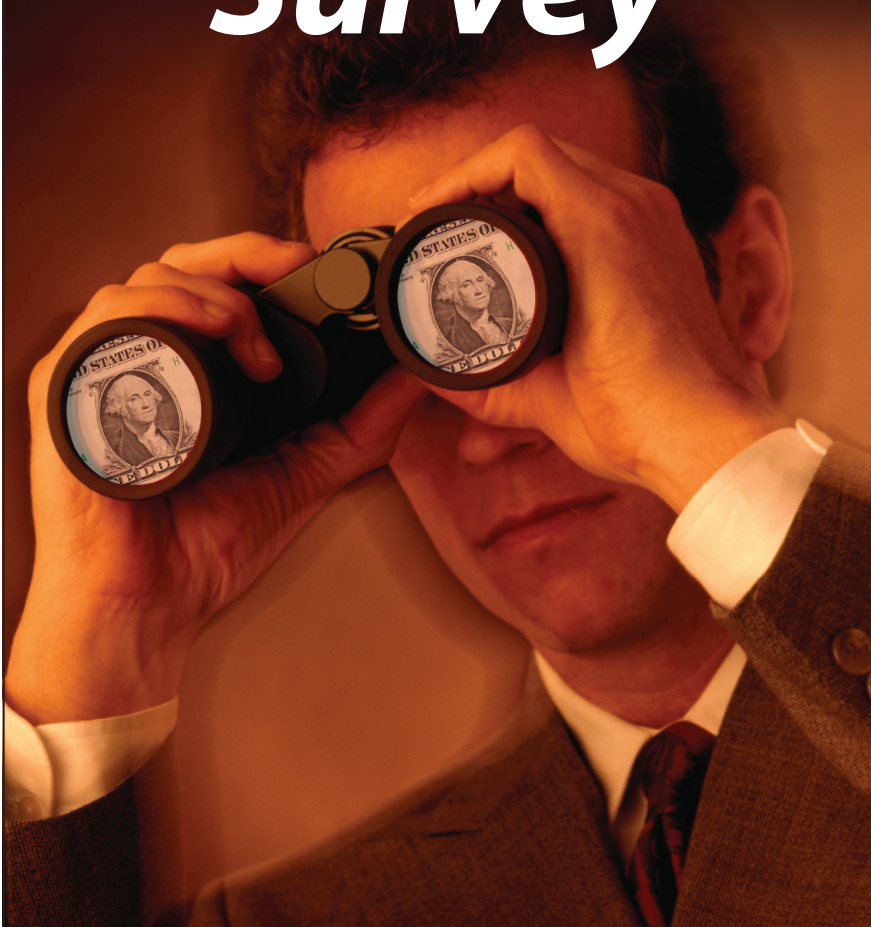
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# Table of Contents



feature

## CAD Salary Survey



A record number of AUGI members participated in our fourth annual survey. Here are the results

8

### AUGIWorld

#### Editorial

##### Managing Editor

Marilyn Law  
marilyn.law@augiworld.com

##### Technical Editor

David Harrington  
david.harrington@augiworld.com

#### Columnists

The CAD Manager: Mark M. Kiker  
Customizing & Programming: Lee Ambrosius  
Architectural Desktop: Melinda Heavrin  
Autodesk Revit: Christopher Fox  
On the Back Page: David Kingsley

#### Contributing Authors

Shaun Bryant  
Fernando Malard  
Todd Shackelford

#### Production

Tim Varnau  
tim.varnau@augiworld.com

#### Advertising

Dan Teeter  
dan.teeter@augiworld.com

#### Controller

Larry Teeter  
larry.teeter@augiworld.com

#### Publisher

Rich Uphus  
rich.uphus@augiworld.com

#### AUGI Board of Directors, 2005

Yoshi Honda, *President*  
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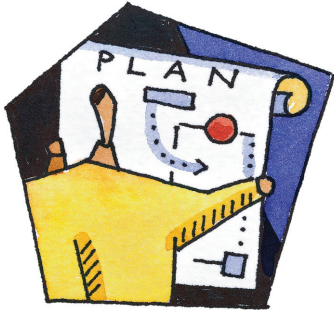
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# Table of Contents

## 4 The CAD Manager

*Dying for Change*



## 6 Education & Training

*Using Complementary Training Methods*



## 14 Autodesk Building Systems

*What's So Great About Autodesk Building Systems?*

## 16 Customizing & Programming

*Working with Enterprise CUI Files*

## 18 Architectural Desktop

*Working with Schedule Tables*

## 20 Discover the Power of ObjectARX

## 24 Autodesk Revit

*The Devil Is in the Details*

## 28 On The Back Page

*Product Lifecycle Management*



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# The Cad Manager



## Dying for Change

*(I've been mostly dead all day)*

In one of my favorite movies, “The Princess Bride,” there is a conversation that goes something like this when the hero of the story (Westley) appears to be dead...

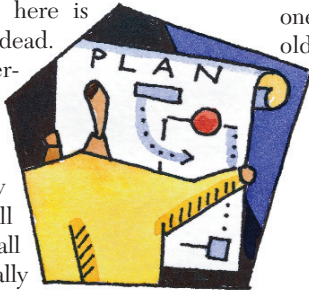
**Miracle Max:** [Lifts and drops the arm of the dead Westley] I've seen worse.

**Miracle Max:** He probably owes you money huh? I'll ask him.

**Inigo Montoya:** He's dead. He can't talk.

**Miracle Max:** Whoo-hoo-hoo, look who knows so much. It just so happens that your friend here is only MOSTLY dead.

There's a big difference between mostly dead and all dead. Mostly dead is slightly alive. With all dead, well, with all dead there's usually only one thing you can do.



**Inigo Montoya:** What's that?

**Miracle Max:** Go through his clothes and look for loose change.

With that as an introduction I would like to segue from “loose change” to “technology change” and how some of us are dying for change.

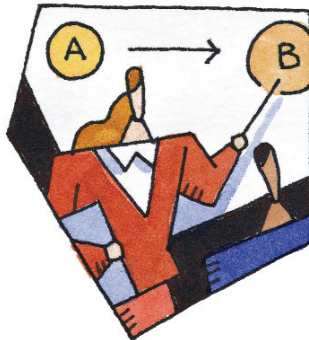
A change of hands for this column begins by taking a look at the need for change in the CAD environment and how the CAD manager should oversee the process.

But first, my compliments to David Harrington for a long stretch of great articles and his continued oversight of this publication. He has done a wonderful job of making us think about issues that need to be discussed and where progress needs to be made. The AUGI membership and the CAD community as a whole are better because of David's efforts.

## Change is inevitable... mostly

Many of the CAD managers I talk with are involved in the process of change. Technology always marches forward and we are often swept up in the process, trying to just keep up. Many firms may be on software subscription and change software whenever it is shipped to them. Just when they complete the deployment and training for one release, the next one comes along.

There are other CAD managers who are not making progress and are frustrated by the lack of change in their firms. I am going to focus this article on the latter—those who are dying for change. If you are one of the many that seems to be tied to an old release, not able to make much progress, not getting much backing, then you need to keep reading.



## How to motivate change

I want to address first the concept of beginning initial movement. It may be very hard to get things rolling from a dead stop. Initially, you should focus on prepping yourself for change. You may be more than ready to get things going, but I want to cover some of the areas you need to organize and think through before you start talking to anyone else.

## Planning the process

I believe that large efforts (and many small efforts) that are worth doing are worth taking the time to plan.

Take some time to think through what needs to be in place to make the change happen. Do you need software, training, or

documentation? Have you spoken with your software vendor? Have you considered the step-by-step process needed for migrating software? (Check out my series “Migration Madness” in *AUGI HotNews* at [www.augi.com](http://www.augi.com) for many of the prep steps you need to take for a successful software migration.)

Take time to get yourself fully geared up before you start thinking about change. Get a copy of the next release of software (even if it is only the demo download). Take time to learn the new features. Think through the ROI issues related to the change. Are the new features worth the upgrade? Be ready to answer these and other challenging questions before you start planning the change.

## The people perspective

Beyond the normal technology considerations,

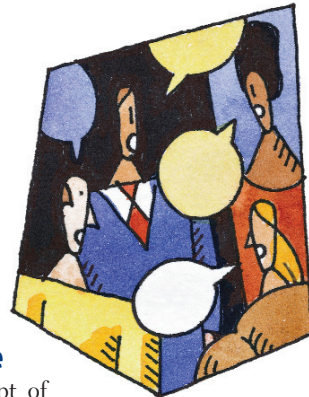
you need to plan out the people process. Often, people are a strong component in keeping change from happening.

Your ability to interact with others will make the most impact on the change process. You will

need to know how to discuss, cajole, convince, negotiate, and sometimes beg people to get what is needed. Here are a few tips for getting people on board and moving them forward.

## Recruiting individuals

Start talking to people one-on-one. Make a list of the influential people within your firm. Who has the power? Who controls the budget? Who has influence within the firm? Don't expect it to be only the official org chart folks. Sometimes the most influential person is not a direct line connection on the org chart. Now start talking to them about what you think





needs to change. Briefly tell your story of what you want to do. This will be a two-minute synopsis. Do not rattle on forever about why, when, where, who, and how. Save that for later. The point is to get initial reactions. Then listen to their perspective. Do they agree with you? Do they even want to hear what you are saying? Is there some negative influence that could be insurmountable (like no budget)? Do they have any positive advice that you should take? Can they provide assistance as you move forward?

## Talking to groups

Now start talking to groups. Talk to local user groups. Talk to internal groups or departments or disciplines. If you have a team of CAD users, talk with them. Listen again for deal breakers and motivational points. Ask them why they may not want to move ahead or why they are dying for change like you are. Define answers to their objections and concerns. Keep track of the positive notes for future use.

## Rally your support

Now that you have talked with a few folks you should have a good idea of who is with you and who is against you. You have

not challenged the status quo yet, but are still prepping for change. Now build a team of people who are aligned with you. These people could be users, managers, or anyone who agrees with your desire to move ahead.

Keep in mind that there may be some political land mines within your firm. You must know where they are and how to navigate around them. I have seen too many technology advancements derailed because of the internal politics of change. Pay attention to these land mines and seek to defuse them before they explode.

You have all of your concepts, ideas, and plans ready and you want to start making progress. I suggest that you start slow and build on what will make the greatest productivity enhancements.

## Start rocking the boat... slightly

Begin to openly discuss the frustrations and shortcomings of the existing situation. Are the tools lacking in an area that impacts production? Talk about these issues. Does the next release answer these troubles? Talk about how that might work. Will moving to the new release increase your ability to produce work in a tangible,

quantifiable manner? Talking about these items will begin to get people thinking that change might be a good thing.

At this stage you are just upsetting the apple cart a little and knocking off some fruit. The point is to start unsettling the current state. Start getting people to think about how difficult it is to stay where they are. How not moving ahead is actually getting them behind. You are not offering the solution yet in a concrete manner. Rather, you are suggesting that there must be better ways of doing things.

Next time, we will discuss the first steps in processing and motivating change in your firm. Until then you can begin to work through some of the concepts I have mentioned.



*Mark W. Kiker is a member of the AUGI Board of Directors. He is the General Editor of BLAUGI and also publishes [caddmanager.com](http://caddmanager.com), the *CADD Managers Journal*, and the *caddmanager.com* blog. He is currently Director of Technology for HMC Architects in Ontario, California and can be reached at [mark.kiker@augi.com](mailto:mark.kiker@augi.com).*

# Special Thanks

AUGI is proud to recognize four outstanding organizations for their contributions to continuing education and training in 2005

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# AUGI

## AUGI's New Look

AUGI will undergo dramatic changes this year and a new logo is the first among them. The logo, composed of two interlocking "speech bubbles," represents the exchange of ideas, information, and knowledge that AUGI facilitates among Autodesk product users.

# Education & Training



## Using Complementary Training Methods

Training is a vast subject with many methodologies and opinions—mine included. While providing training and consultancy services, I can safely say that after 17 years of exposure to AutoCAD®, I am still learning. Speaking of learning, the main subject of this article is alternative and complementary training methods. By this I mean training that can be used as an alternative to classroom-based training and training methods that can complement classroom-based training. Trust me—there are a lot of them out there!

### The basic training model

First things first, though. You will never replace classroom-based training for AutoCAD. When you take your AutoCAD Essentials course, nothing can beat learning within your own peer group with an experienced trainer. Most AutoCAD trainers come from industry and have spent many years going through the same training process that you are going through sitting in that training room. If they are an accredited Autodesk Approved Instructor (AAI) working for an Authorized Training Center (ATC), they also have had to attend product update courses and take their Professional Services Examination (PSE) for the latest version of AutoCAD. The PSE for AutoCAD 2006 had a pass-mark of 85 percent. This should give you a good indication of the quality of the trainers working in ATCs. They also have to renew this exam every year to maintain their AAI status and keep up-to-date with the developments in new versions of AutoCAD.

The classroom model is simple but effective. Autodesk provide a syllabus that follows the Autodesk Official Training Courseware (AOTC) manuals. These have dramatically improved over the last few years and the 2006 versions are the best so far (in my humble opinion). Using these manuals, the instructor provides training by going through worked examples and training exercises. This is done in a training room that has audio-visual facilities such as

an LCD projector or an interactive whiteboard. The Autodesk ATC Partner Program also specifies that ATCs must equip each trainee with an AutoCAD workstation and Internet access. The trainees then receive their AutoCAD training while using AutoCAD during their course. Then they receive their certificates, proving them to be well-rounded AutoCAD users!

This training model has been in place for as long as I have been exposed to AutoCAD and many years before. The length of time it has been around indicates how successful it actually is. However, there remain the “doubting Thomases” out there who claim they cannot justify three days out of the office for an AutoCAD Essentials course. Three days in that classroom could make them a whole lot more productive in their CAD environment. The long-term productivity gains from those three days would more than cover the time out of the office. Any one of them could become the AutoCAD “guru” within their organization. Who knows, they may even become an Autodesk instructor themselves one day! If you want inspiration, look to Lynn Allen, the Autodesk Technical Evangelist. She was an AutoCAD trainer once.

Classroom-based training is fundamental to our overall mental development. Many of us have spent a large part of our lives in a classroom. As a result, our mental processes respond best when we are taught by a “teacher”—in this case, the AutoCAD instructor.

### Distance learning

A solution for the doubting Thomas may be the distance learning technique commonly known as the correspondence course. This is very different from the classroom model. The basic premise is that you work in your own time, in a “classroom” of your own choosing, normally at home.

The training organization provides the training materials that provide the core learning syllabus. You then work through specific modules to deadlines set by your

distance-learning tutor/mentor, who is normally at the end of a telephone line or email connection. Some forward-thinking distance learning organizations are now also offering web-based tutorials. This can be done in a number of ways, the most common being web-based conferencing, which allows for a large number of students to attend at any one time.

Distance learning is ideal for busy people as it allows them to work at their discretion. It also has some disadvantages. You do not get that one-to-one relationship provided by the instructor in the classroom and you will have to rely on your own resolve to stick to the course and finish it.

You also have to finish the course in an optimum amount of time. Autodesk is now releasing a new version of AutoCAD every year. If it takes you three years to complete your course because you have really taken your time, you could be three versions of AutoCAD behind everyone else! By this time, you may know the core AutoCAD functions, but you will not be able to take advantage of all of the new features made available in the versions you missed. For example, AutoCAD 2006 was one of the most feature-rich releases I have seen for some time and I am still finding new features I never knew existed!

The distance-learning model in the United Kingdom (where I am) can provide a means to an end. A prime example of this would be using an AutoCAD distance learning course to study for an accredited qualification such as the City & Guilds AutoCAD examination. This is highly regarded by employers in the United Kingdom as it demonstrates a sound knowledge of AutoCAD.

A number of UK-based companies have grasped the distance learning “nettle” and provide comprehensive distance learning material for AutoCAD. Primarily, it is the City & Guilds syllabus that is on offer, but there are others appearing. The European Computer Driving Licence (ECDL) now has a CAD module, for example.



In conclusion, distance learning provides an ideal medium for a focused individual who requires training outside of his or her working environment. That individual may be a busy professional or a person who is retraining for a change in career direction.

## Web-based learning

Broadband and cable are now allowing for learning over the Internet. This is sometimes known as collaborative learning. Autodesk is taking advantage of this with the Autodesk Subscription Program. When you sign up for subscription on AutoCAD, you can use the AutoCAD Help function to locate the training offered.

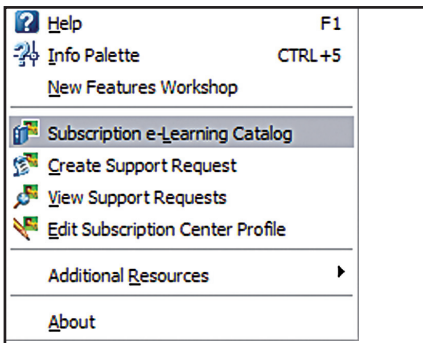


Figure 2 – The AutoCAD 2006 Help pull-down menu.

The Subscription e-Learning Catalog website provides a comprehensive list of exercises that take approximately 30 minutes each to complete.

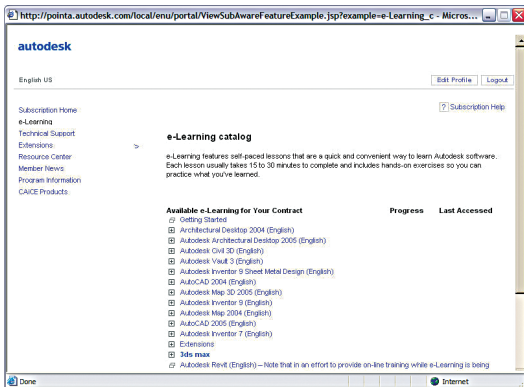


Figure 3 – An example of the Subscription e-Learning Catalog.

AutoCAD 2006 also provides Online Training Resources in the Additional Resources menu on the Help pull-down menu. This links you to training material on the Autodesk website. Typical contributors include Lynn Allen, Lee Ambrosius, and Robert Green.

Another excellent example of web-based learning is the AUGI Training

Program (known as the ATP). This is free to AUGI members, so there is no excuse not to join!

## Computer-based training (CBT)

As the name implies, this is training on a computer (doh!). You may think that this is the same as the classroom-based model. It is not. It tends to be a few Windows-based video files thrown onto a CD with an audio voiceover. I have developed a couple of these for my customers and they are extremely effective—provided you get the marketing right and, more importantly, you get the right type of trainee using it. The sort of trainee you want is similar to the one who would take up distance learning. I have seen CAD managers purchase CBT for their AutoCAD users thinking it will save them money and replace classroom-based training. Wrong! On most of these occasions, the material has become “shelfware” because the CAD users just do not have the time or the inclination to utilize the CBT material effectively.

AutoCAD offers computer-based training in the New Features Workshop. This allows you to investigate the new features of AutoCAD, from AutoCAD 2004 onward, based around the Autodesk ethic of Create, Manage, Produce, and Share. It is found on the Help pull-down in AutoCAD.

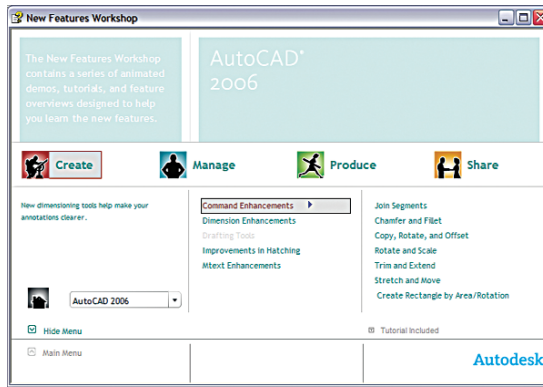


Figure 4 – The New Features Workshop showing the command enhancements available in AutoCAD 2006.

Computer-based training is an excellent complement to a software product (AutoCAD 2006 being a prime example), but should not be used as a replacement for the classroom-based model.

## Complementary Methods

Looking at the training methods mentioned here, we can clearly see that the

most established is the classroom-based model. This is probably why it is the most effective. It has been on the block the longest and during that time has been developed to a level where the quality of training is always high. This does not mean, however, that the quality of the other methods are poor. It depends on how much effort the trainee puts into them, the distance learning model being a prime example.

All of the methods discussed here complement one another. You could run a classroom-based course for a group of trainees who would then attend a web-based seminar (webinar) months later at their own offices. This could easily be organized using Webex or LiveMeeting. All of the trainees could attend without even leaving their desks. With broadband the way it is, this is becoming more and more commonplace.

As a training consultant, I cannot stress enough how important it is to continue your training throughout your working career. As an Autodesk Approved Instructor, I have to attend at least one AutoCAD update course per year to keep up with AutoCAD for my Professional Services Examination. In addition, I always scan the Internet and the CAD press to see what is available, just in case I see courses that could help me work smarter.

There is a plethora of courses out there. Choose the one you want and the method of learning that suits you.

Then get your business justification in place and, who knows, you might just get your boss to pay for it! Regardless of whether you are an AutoCAD guru or a complete beginner, there are always opportunities to learn more.

Look at me; I'm still learning after all these years!



Shaun Bryant is director of STJ2 Consultants Limited, providing AutoCAD training and consultancy services. He is currently vice-chairman of the Autodesk UK/Ireland Authorized Training Centre Advisory Board (ATCAB). He can be reached at shaun.bryant@stj2.com.

# 2006 CAD Salary Survey



Our annual salary survey of AUGI members brought a record number of responses. In this article, we break down the salaries, by geographic region, for the four top job functions, and look at age, gender, experience, education, job benefits, and more

In October 2005, we invited all AUGI members to take our online salary survey. An unprecedented number responded, and we thank you. The survey comprised questions ranging from those that sought to gather compensation-related data to others including age, gender, highest education level, company size, and industry. The results from the thousands of responses we received are analyzed herein.

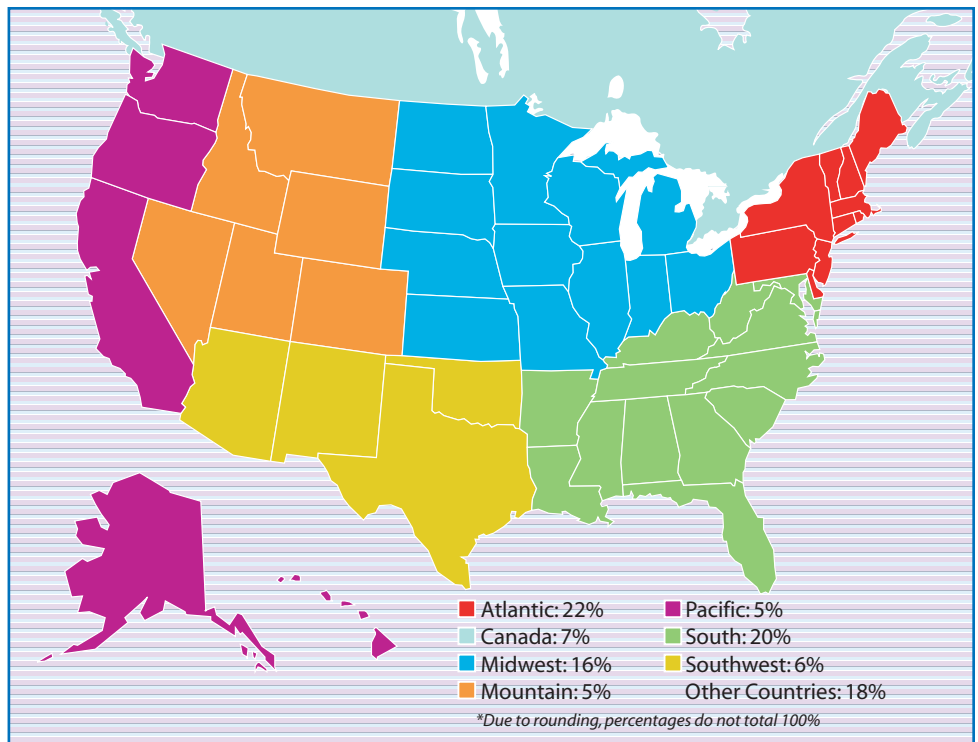
Unlike previous salary surveys, this year we received enough response from AUGI members residing outside the U.S. and Canada to enable us to include international data. That data is represented by the "International" designation in the various breakdowns.

AUGI's annual CAD Salary Survey is an *AUGIWorld* staff report. Special thanks to Melanie Stone, AUGI survey manager, for analyzing the survey data.

Due to space limitations in *AUGIWorld*, we are unable to include data for other job titles or publish other analyses in this issue. We have placed extra material on the AUGI website at [www.AUGI.com](http://www.AUGI.com).

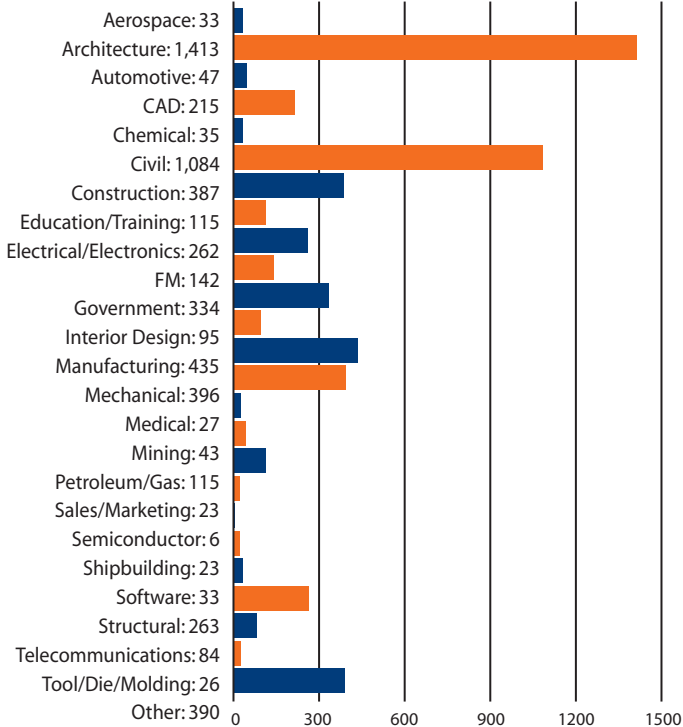
We heard from several AUGI members about changes they would like to see in next year's survey and we welcome all comments. Please email suggested improvements for the 2006 survey to [editor@augiworld.com](mailto:editor@augiworld.com).

## Respondents By Geographic Location

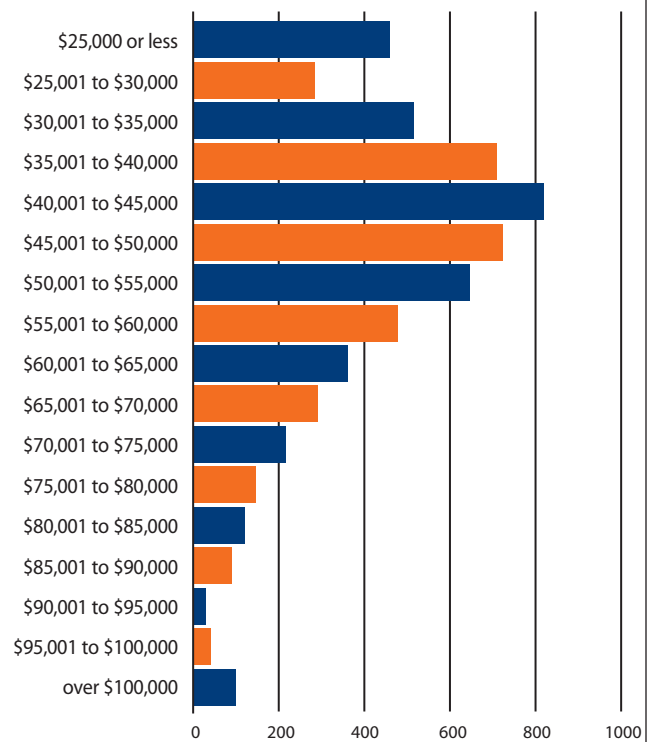




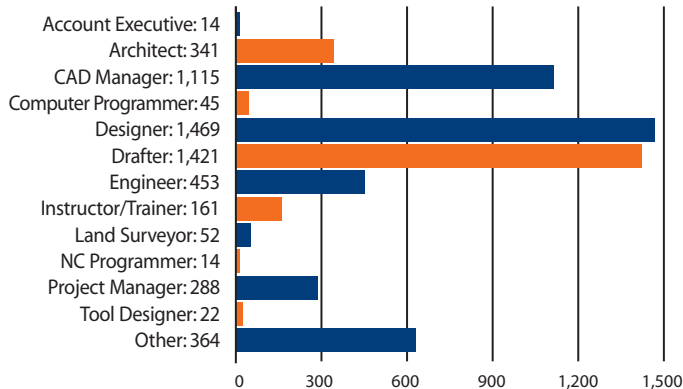
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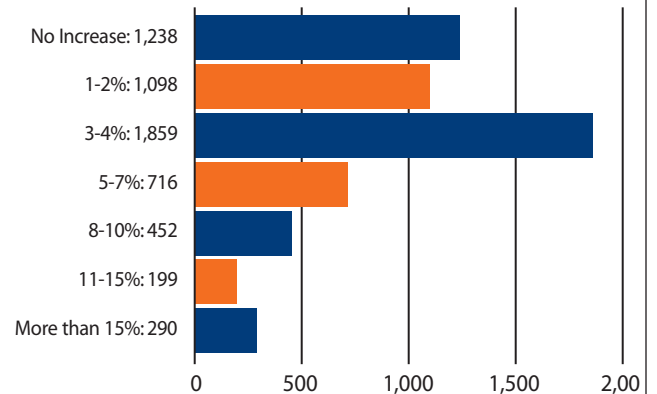
## Annual Compensation in 2005



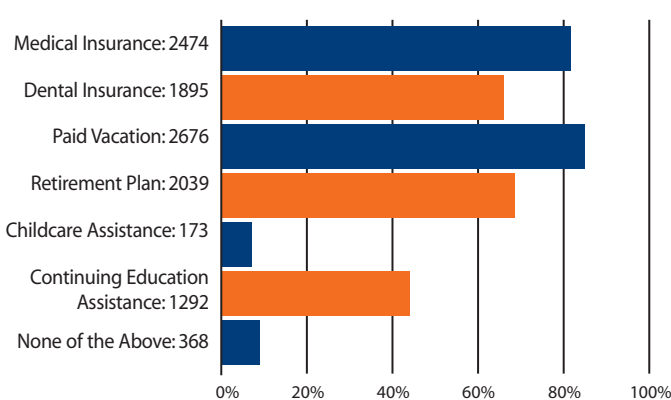
## Job Title/Function



## Salary Increase in Last 12 Months

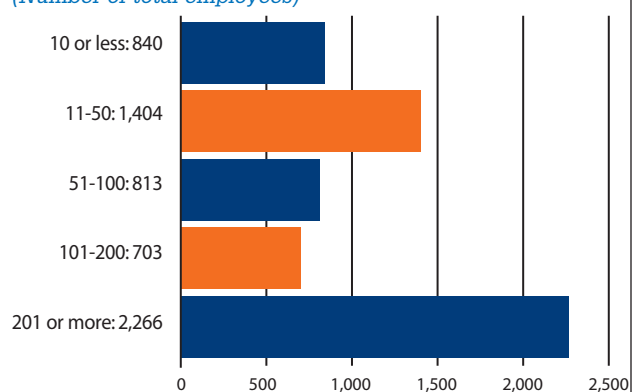


## Employee Benefits



## How Big Is Your Company?

(Number of total employees)

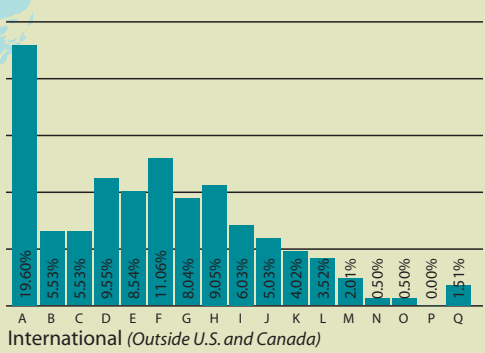




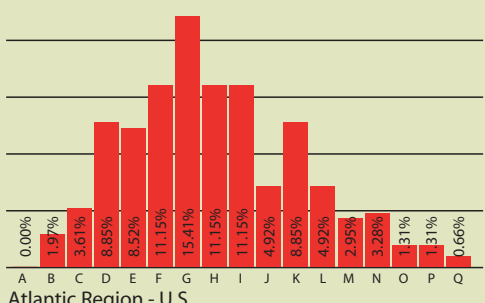
### Salary Range

- A \$25,000 or Less
- B \$25,001 to \$30,000
- C \$30,001 to \$35,000
- D \$35,001 to \$40,000
- E \$40,001 to \$45,000
- F \$45,001 to \$50,000
- G \$50,001 to \$55,000
- H \$55,001 to \$60,000
- I \$60,001 to \$65,000
- J \$65,001 to \$70,000
- K \$70,001 to \$75,000
- L \$75,001 to \$80,000
- M \$80,001 to \$85,000
- N \$85,001 to \$90,000
- O \$90,001 to \$95,000
- P \$95,001 to \$100,000
- Q \$100,001 or more

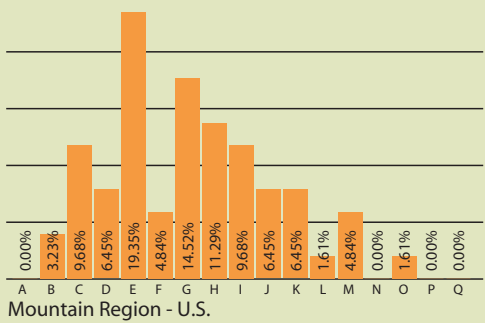
# Salary Range for CAD Manager



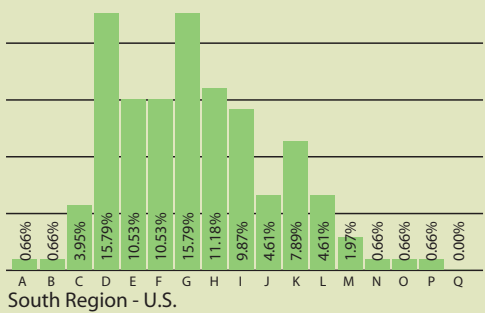
International (Outside U.S. and Canada)



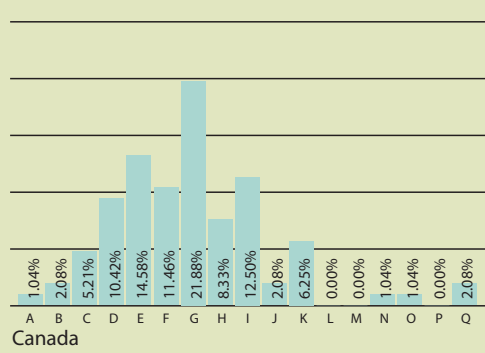
Atlantic Region - U.S.



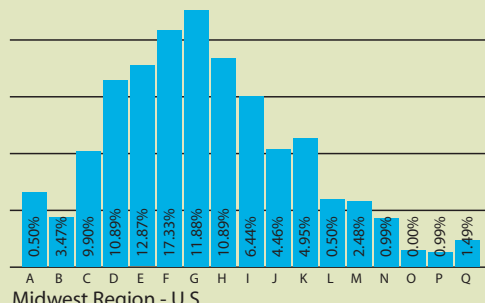
Mountain Region - U.S.



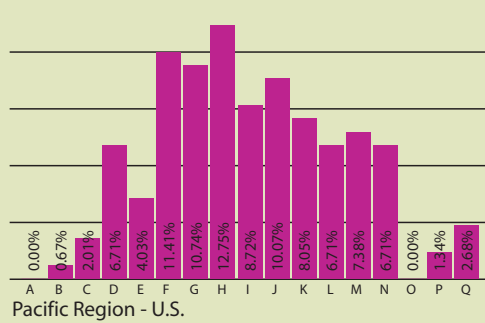
South Region - U.S.



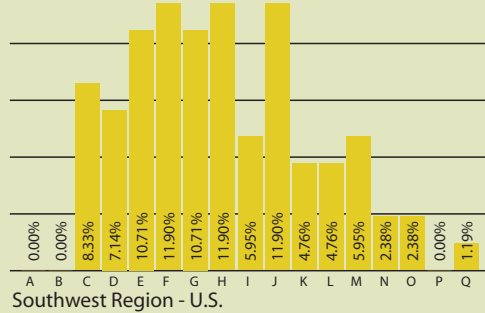
Canada



Midwest Region - U.S.



Pacific Region - U.S.



Southwest Region - U.S.



The four job titles held by the largest number of survey respondents were selected for salary analysis. They are CAD Manager, Designer, Drafter, and Engineer.

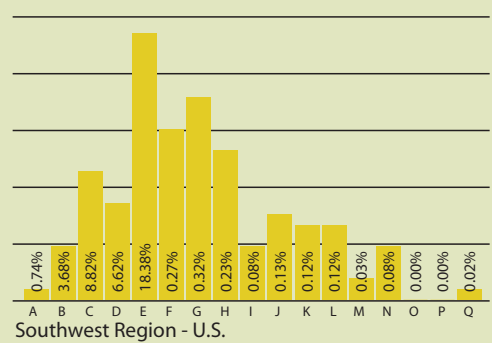
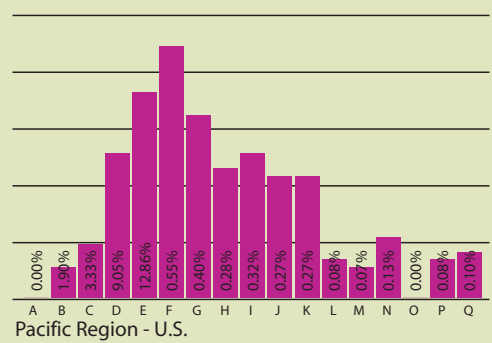
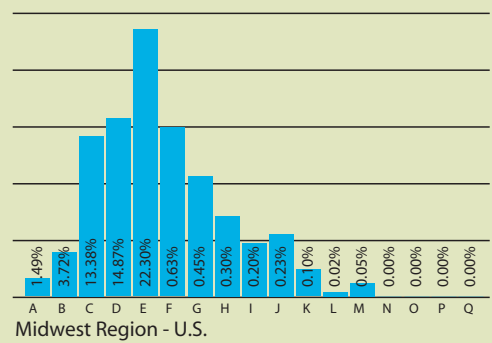
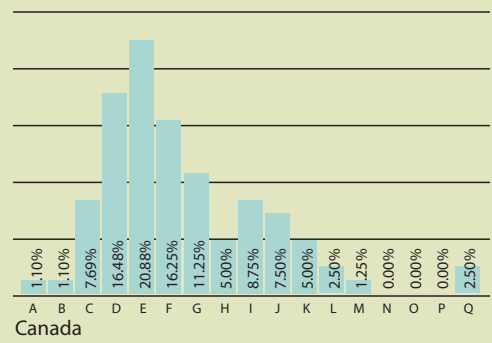
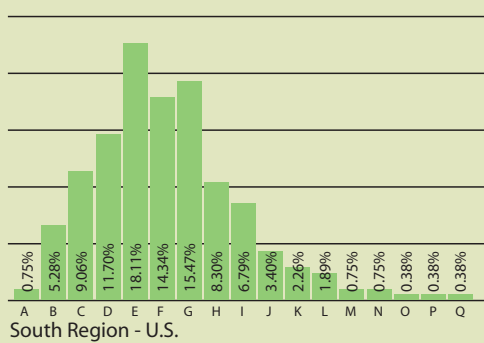
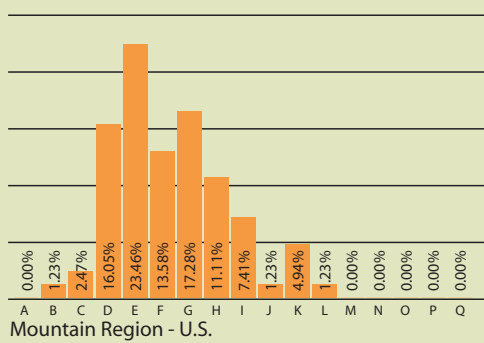
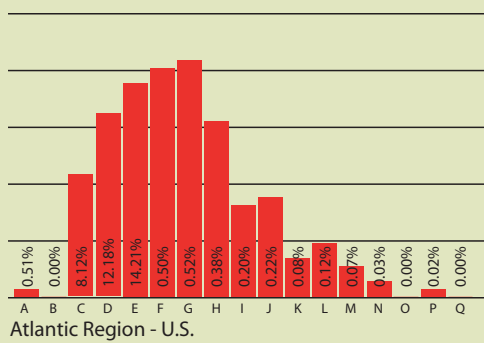
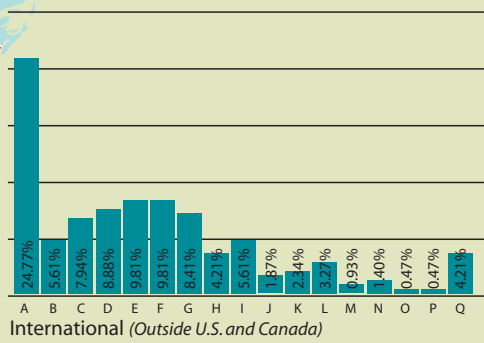




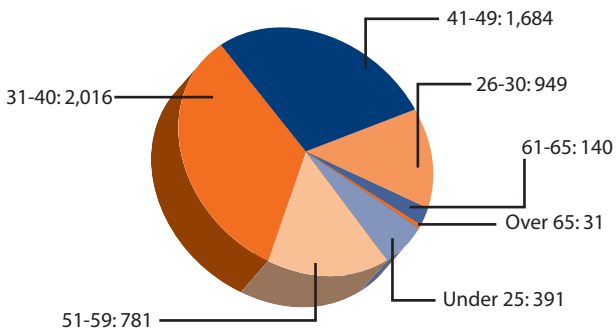
### Salary Range

- A \$25,000 or Less
- B \$25,001 to \$30,000
- C \$30,001 to \$35,000
- D \$35,001 to \$40,000
- E \$40,001 to \$45,000
- F \$45,001 to \$50,000
- G \$50,001 to \$55,000
- H \$55,001 to \$60,000
- I \$60,001 to \$65,000
- J \$65,001 to \$70,000
- K \$70,001 to \$75,000
- L \$75,001 to \$80,000
- M \$80,001 to \$85,000
- N \$85,001 to \$90,000
- O \$90,001 to \$95,000
- P \$95,001 to \$100,000
- Q \$100,001 or more

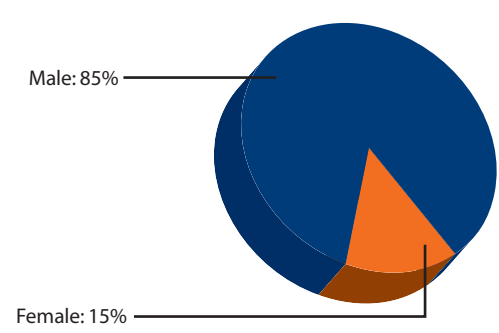
# Salary Range for Designer



### Employee Age



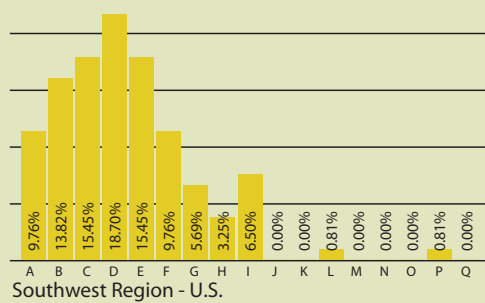
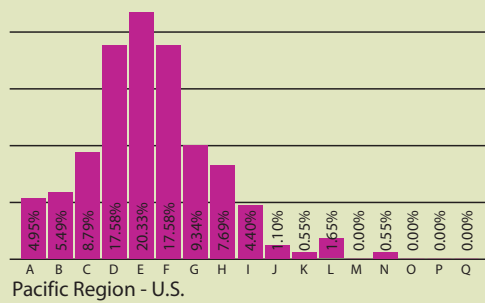
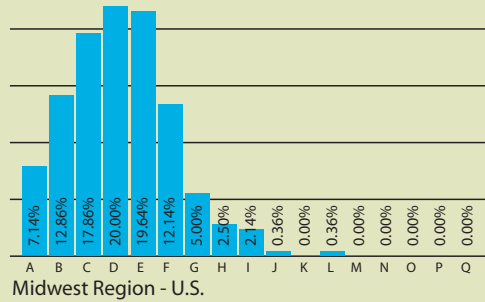
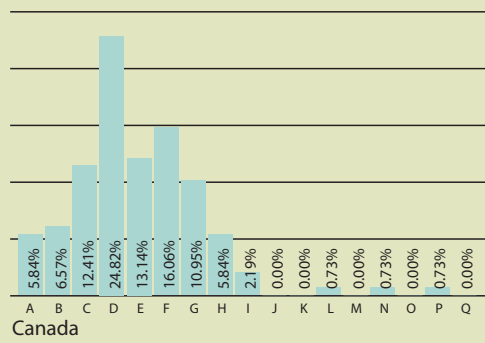
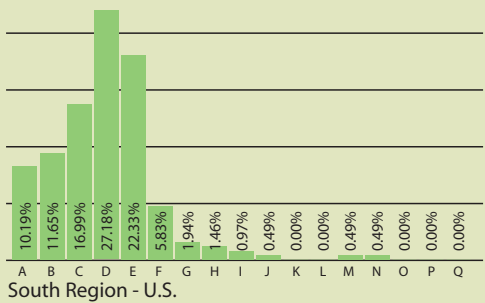
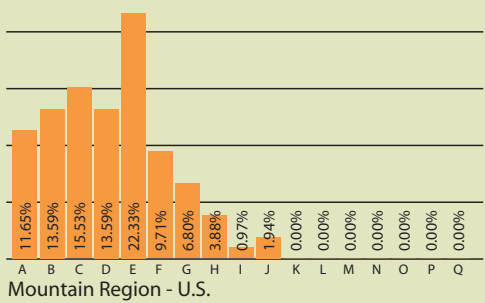
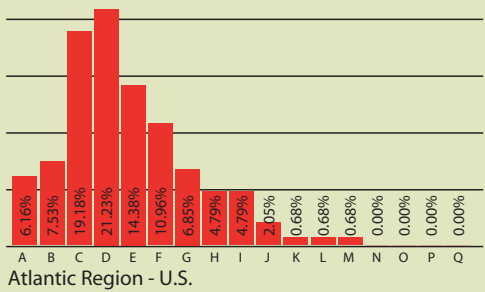
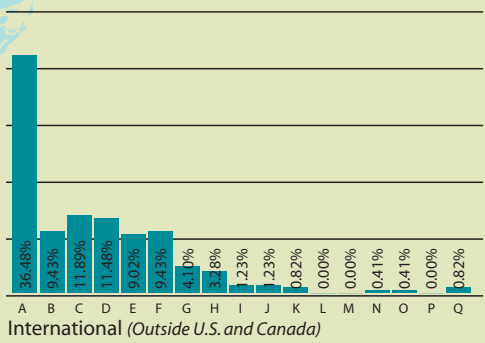
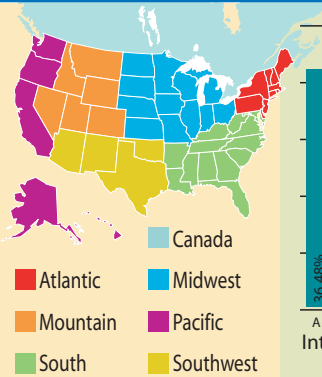
### Employee Gender



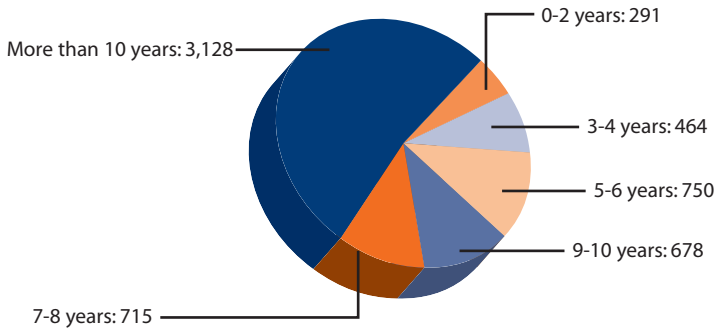
# Salary Range for Drafter

## Salary Range

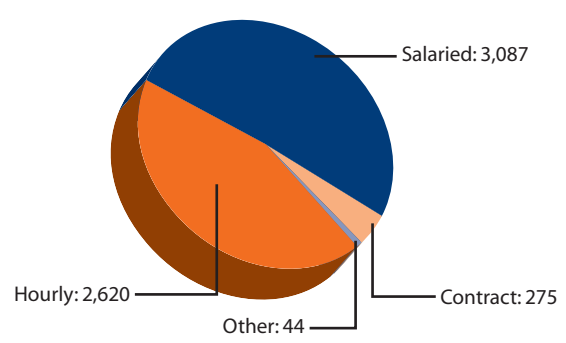
- A \$25,000 or Less
- B \$25,001 to \$30,000
- C \$30,001 to \$35,000
- D \$35,001 to \$40,000
- E \$40,001 to \$45,000
- F \$45,001 to \$50,000
- G \$50,001 to \$55,000
- H \$55,001 to \$60,000
- I \$60,001 to \$65,000
- J \$65,001 to \$70,000
- K \$70,001 to \$75,000
- L \$75,001 to \$80,000
- M \$80,001 to \$85,000
- N \$85,001 to \$90,000
- O \$90,001 to \$95,000
- P \$95,001 to \$100,000
- Q \$100,001 or more



## Years Of Experience



## Compensation



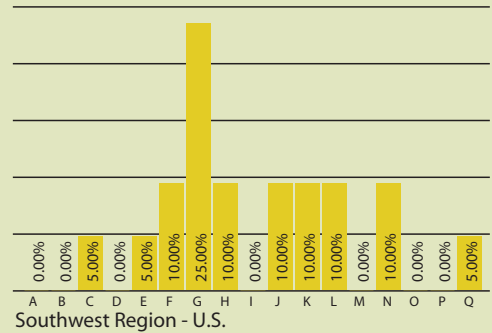
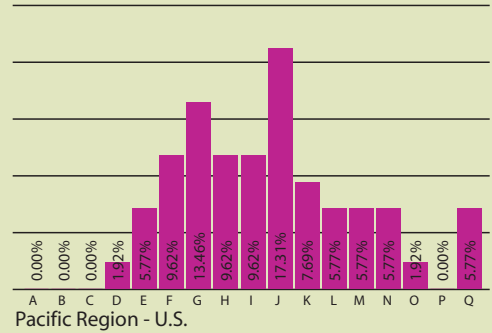
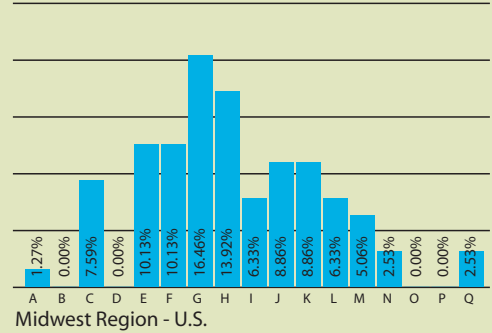
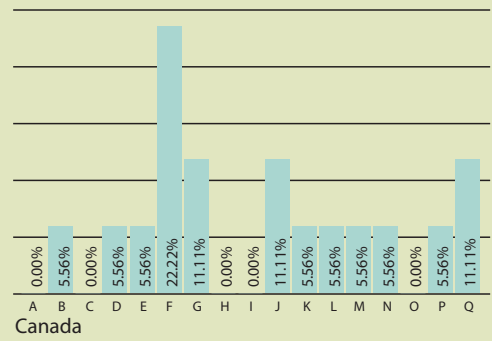
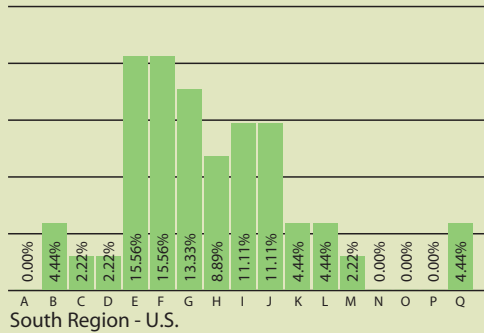
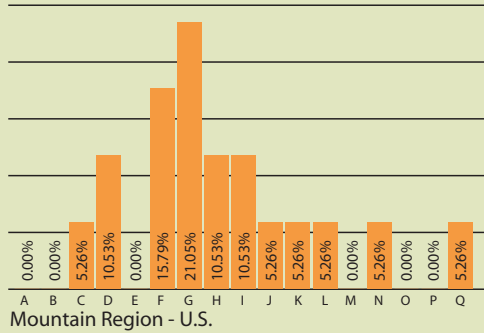
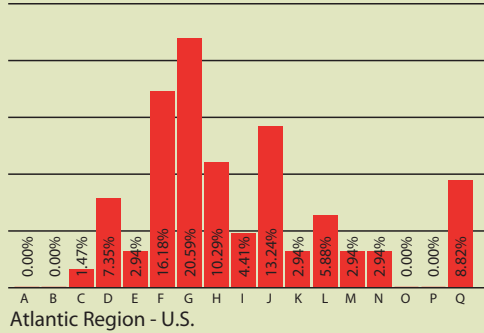
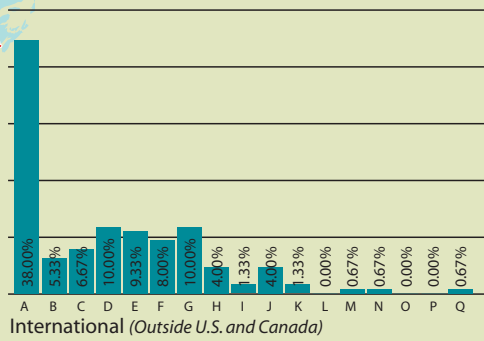




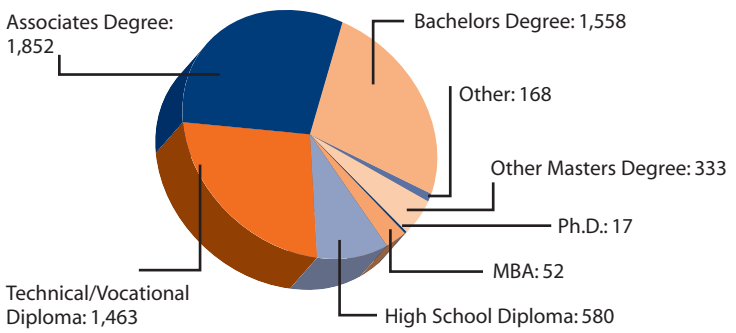
### Salary Range

- A \$25,000 or Less
- B \$25,001 to \$30,000
- C \$30,001 to \$35,000
- D \$35,001 to \$40,000
- E \$40,001 to \$45,000
- F \$45,001 to \$50,000
- G \$50,001 to \$55,000
- H \$55,001 to \$60,000
- I \$60,001 to \$65,000
- J \$65,001 to \$70,000
- K \$70,001 to \$75,000
- L \$75,001 to \$80,000
- M \$80,001 to \$85,000
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- O \$90,001 to \$95,000
- P \$95,001 to \$100,000
- Q \$100,001 or more

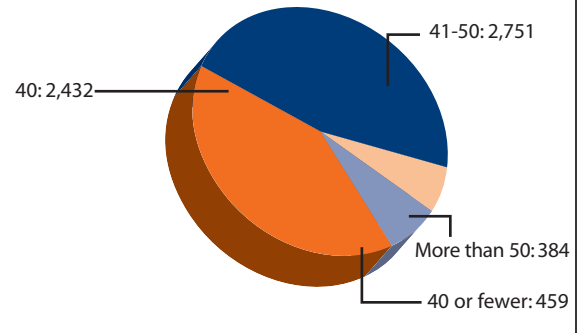
# Salary Range for Engineer



### Education



### Hours Worked Per Week



# What's So Great About Autodesk Building Systems?

One of the most powerful tools in Autodesk® Building Systems (ABS) is scheduling. Using a predefined schedule is easy, but figuring out how that schedule works and how to customize it is not. I hope to answer those questions in this article.

## How does it work?

Objects in ABS possess sets of properties specific to that object. For example, a diffuser has a property for flow, a receptacle has a property for circuit number, and a sink has a property for fixture type. These properties can be assigned by the designer or extracted from the object or style, linked to the object by the tag and reported by a schedule. The best way to understand these relationships is to create a schedule from scratch.

## Creating a basic schedule

When creating a schedule, first determine what it is the schedule should report. For this example I will create a small diffuser schedule that reports the number of diffusers in a drawing, the diffuser type, and the diffuser's flow.

Before creating this schedule, place some diffusers in a drawing and set different CFMs in them. Tag the diffusers to link the property set data to the diffusers so it can be released to the schedule. Unlinked data will result in schedule cells or properties being left blank or the schedule reporting “?”s. This is the schedule's way of telling you that it knows the object is out there but it can't read all of its properties.

Schedules, like other objects in an ABS drawing, are controlled by a style. If you are familiar with a text style in AutoCAD®, the same general premise applies. The text style is used to control the text height, width, and font of the text, the same way our schedule style will control the columns, content, and look of our schedule.

To create a new schedule style, open the Style Manager by selecting it from the Format pull-down menu. Schedule styles are found under the Documentation Objects heading of the current drawing. Select Schedule Table Styles, right-click,

and then select New. This will open the new schedule table style for edit. There are seven tabs in a schedule table style. Let's start at the left and visit each tab that will define our schedule (see Figure 1).

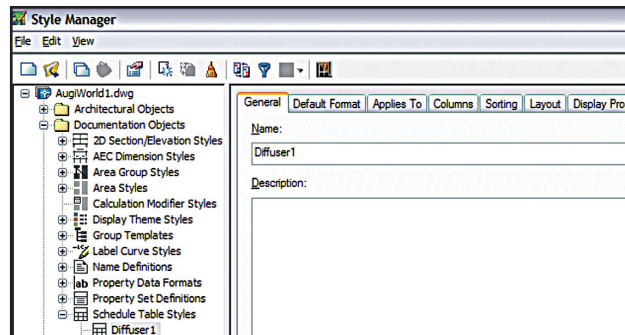


Figure 1

Start with the General tab and name this new style “Diffuser 1.” You may then supply a description if you like and attach any notes by selecting the Notes Button.

The Default Format Tab controls the text appearance and cell configuration of the schedule. Assign the text style, alignment, height, gap, and rotation here. There is a control Matrix symbol, used in matrix columns or, if checked, to denote true/false values. Cell size can also be controlled. For this example I will accept all of the default values in this tab.

The Applies To tab is used to filter the types of objects to schedule. Click the Clear All button to uncheck all the object types, then recheck Multi-View Part. Under Classifications select Air Terminal. This schedule will now only extract data from multi-view parts that are air terminals and ignore everything else.

The Columns tab is used to define the column headings and how the data below should be formatted. First check the Include

Quantity Column check box. This will give us our first column header of Quantity. Next select the Add Column button, which will bring up the Add Column dialog box. Properties that you can add as a column are

sorted by the properties set from which they originate in the Categorized tab, or alphabetically in the Alphabetical tab. In either tab select Flow\_CFM. In the Column Properties area, change the Column Heading to CFM. Ensure the Data Format is Flow-CFM.

You can change the cells properties if you like using the Override Cell Format button. In the Column Position area select Insert After, then QTY. This places the CFM column directly after the Quantity Column (see Figure 2).

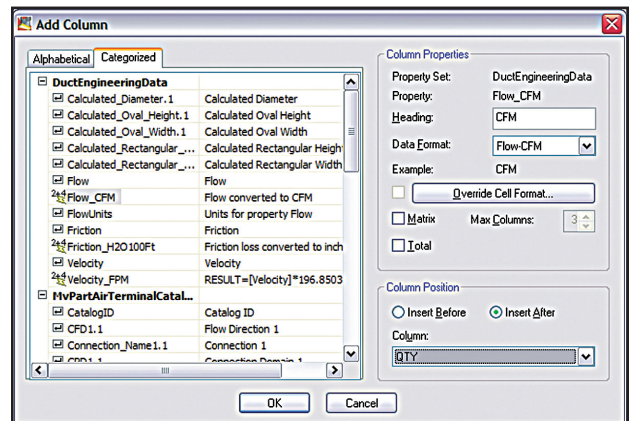


Figure 2

Next select the Add Column button again. This time select PD Part description.

Select OK to insert the column in the last position. Now Select the Part Description column, hold down your “ctrl” key to also select the CFM column. With both columns selected click the Add Header button and type PART INFORMATION to add a header over the CFM and Part Description columns.



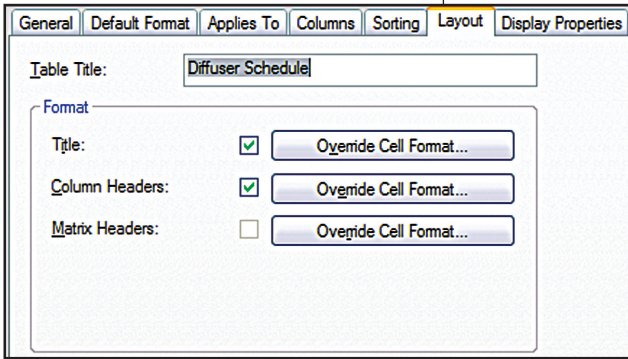


Figure 3

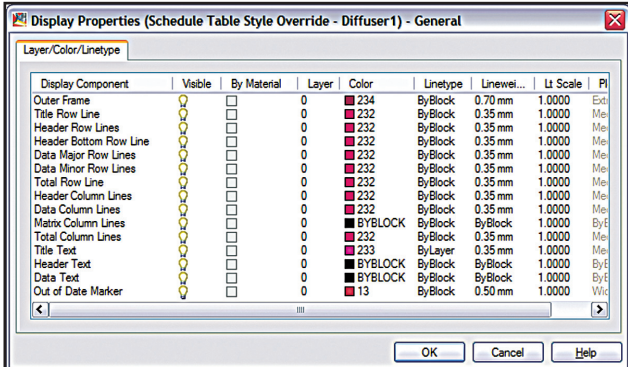


Figure 4

The Sorting tab allows the user to define how the schedule rows will be sorted. Select the ADD button to choose a property to sort by. The sort order can be set by property to ascending or descending. Add more properties, subsorting first by CFM then by quantity. Properties are sorted starting from the top and going down. Use the Move Up and Move Down buttons to change the sort order.

The Layout tab supplies a place to define the table title or schedule name. It is also the place where overrides for text appearance and cell configuration of the title, column headers and matrix headers can be applied. I will make my table title Diffuser Schedule and set a different style for the title and column headers text by selecting the Override Cell Format buttons next to them (see Figure 3).

The Display Properties tab allows me to define color, visibility, layer, and more for all parts of the schedule. Check the Style Override check box to open the Display Properties dialog box (see Figure 4).

Select OK in the Display Properties dialog box, then click Apply and OK to close the Style Manager (see Figure 5).

The schedule is now complete so let's test it. One of the easiest ways to add this schedule to a drawing is to insert a standard schedule then change its style in Properties

Diffuser Schedule										
PART INFORMATION										
Quantity	CFM	Part Description								
2	200 CFM	450 x 450 mm	Square	Louver	Face	Ceiling	Diffuser	Round	Neck	US Metric
2	300 CFM	450 x 450 mm	Square	Louver	Face	Ceiling	Diffuser	Round	Neck	US Metric
2	500 CFM	450 x 450 mm	Square	Louver	Face	Ceiling	Diffuser	Round	Neck	US Metric

Figure 5

to the new schedule style. You can also drag the new style from the Style Manager to your palette. Once in the drawing, the new schedule can now be dragged into a palette for future inserting. A word of warning: if you were in Drawing1.dwg when you dragged the schedule to the palette and you later move or delete Drawing1.dwg, the palette tool will no longer function because it is only a link to the drawing from which the style definition came. A good practice is to only drag

tools to a palette from a safe network or local drive that you are sure you will not accidentally move or delete.

One last piece of advice—don't start from scratch if you can help it. Check the palettes and content browser for any schedule that is close to what you are trying to produce. Insert this schedule into a blank drawing. Select the schedule, right-click, and pick Copy and Assign to create a copy of the original style that can be freely changed.



Todd Shackelford is an applications engineer working for Avatech Solutions. Todd is an ADT Certified Expert who has provided support for MEP and structural consultants for 11 years. You can contact him at [todd.shackelford@avatechsolutions.com](mailto:todd.shackelford@avatechsolutions.com).

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# Working with Enterprise CUI Files

Welcome to a New Year, and welcome to the new customizing and programming section of *AUGIWorld*. This column will mix things up from time to time, touching on various customization topics that range from creating Dynamic Blocks to using the Customize User Interface (CUI) editor and programming topics from AutoLISP to VBA for good measure. Anything that is in the realm of customization and programming is fair game for this column, so if you have thought about enhancing your workflow through customization, you have come to the right place.

Not only is this a new year, but I am making the transition from writing for *AUGI HotNews* to *AUGIWorld*. I hope to hear from many of you about what you would like to see covered in this column. Now that the stage has been set, let's kick things off. In this article I will explore one of the new concepts that CUI has brought—Enterprise CUI files.

## Enterprise CUI file defined

So what exactly is an Enterprise CUI file? An Enterprise CUI file is no different than any other customization file except for how and when it is loaded. An Enterprise CUI file is the first customization file loaded into AutoCAD®, if one is specified. Typically, you will put into the Enterprise CUI file those user interface elements that you don't want users changing. This could be the ACAD.CUI file that comes with AutoCAD or it could be a menu that you used in past releases that contains your company's specific tools.

The CUI editor treats the Enterprise CUI file as read-only, but this is only while the file remains designated as an Enterprise CUI file through the Options dialog box. You still need to make sure that the file is in a read-only location to prevent a user from changing the main and enterprise CUI file designations around in order to make changes to the file.

## Setting up an Enterprise CUI file

Enterprise CUI files are set up through the Options dialog box. Follow the steps below to set up an Enterprise CUI file.

1. Launch the Options dialog box by typing in

the command `OPTIONS` at the command line or from Tools menu >> Options...

2. In the Options dialog box, click the Files tab.
3. On the Files tab, click the plus sign next to Customization Files.
4. Click the plus sign next to Enterprise Customization File.
5. Select the value under Enterprise Customization File and click Browse. By default the value is nothing, which is represented by a period.
6. In the Select a File dialog box, browse to the location of the CUI file that you want to use as the Enterprise CUI file.
7. Select the CUI file and click Open.
8. In the Options dialog box, click OK to save the changes made. AutoCAD will reload all the customization files in the following order:

- Enterprise CUI file
- Any partial CUI files referenced by the Enterprise CUI file (the partial CUI files are loaded in the order they appear under the Partial CUI node in the CUI editor)
- Main CUI file
- Any partial CUI files referenced by the main CUI file

## Using AutoLISP

There is no API or system variable that allows you to specify an Enterprise CUI file. There is, however, an environment variable that can be manipulated using AutoLISP and the `Getenv` function. This allows you to remotely deploy an Enterprise CUI file without the need to visit each computer and set it up through the Options dialog box. Figure 1 shows some sample code that demonstrates how to assign an Enterprise CUI file.

```
(defun LoadCUIFiles ( strMainMenu strEntMenu / strMainMenu strErrMsg)
  (setq strEntMenu (findfile strEntMenu))
  (setq strMainMenu (findfile strMainMenu))

  (if (and (/= strEntMenu nil)(/= strMainMenu nil))
    (if (and (/= (strcase (getenv "EnterpriseMenuFile"))
      (strcase (substr strEntMenu 1 (- (strlen strEntMenu) 4)))
    )
      (/= (strcase (getvar "MenuName"))
        (strcase (substr strMainMenu 1 (- (strlen strMainMenu) 4)))
      )
    )
    (progn
      (setenv "EnterpriseMenuFile" strEntMenu)
      (command "._menu" strMainMenu)
    )
  )
  (progn
    (cond
      ((and (= strEntMenu nil)(= strMainMenu nil))
        (setq strErrMsg (strcat "Files " strEntMenu " and " strMainMenu " are missing."))
      )
      ((= strEntMenu nil)(setq strErrMsg (strcat "File " strEntMenu " is missing."))
      )
      ((= strMainMenu nil)(setq strErrMsg (strcat "File " strMainMenu " is missing."))
      )
    )
    (prompt strErrMsg)
  )
  )
)
```

Figure 1



Here is an example of how to use the AutoLISP function above:

```
(loadCUIFiles "custom.cui" "acad.cui")
```

The example sets the file CUSTOM.CUI as the main CUI file and ACAD.CUI as the enterprise CUI file.

## Modifying an Enterprise CUI file

The Enterprise CUI file is marked as read-only by the CUI editor so you have to set the Enterprise CUI file as the main CUI file. There are three common ways to approach this.

- To change the values under the Customization Files node of the Files tab in the Options dialog box and then change them back after you have made the necessary edits.
- To create two different profiles and switch between the two when you want to edit the Enterprise CUI file. One will have the main and enterprise CUI files setup like your users have and the other one will have the two values inverted.
- To use an AutoLISP program that is similar in concept to creating two different profiles and switching between them. The program that I use is shown in Figure 2.

```
;; Flip CUI files
(defun c:FC ( / strEntMenu strMainMenu)
  ;; Get the current Enterprise CUI filename
  (setq strEntMenu (getenv "EnterpriseMenuFile"))

  ;; Get the current main CUI filename
  (setq strMainMenu (getvar "MENUENAME"))

  ;; Set the main CUI as the Enterprise CUI
  (setenv "EnterpriseMenuFile" strMainMenu)

  ;; Load the Enterprise menu as the main CUI file
  (command ". _menu" strEntMenu)
)
```

Figure 2

Load the program into AutoCAD through a file such as Acaddoc.lsp or some other method familiar to you. Once the program is loaded, type in FC at the command line. Then when you start the CUI editor, the enterprise and main CUI files should be switched around. Just type FC at the command line again to flip the two CUI file designations.

## Benefits

The Enterprise CUI file can take a bit of time and effort to understand, but using it will save time when rolling out updates and during migration to new releases. I hope this article has helped to show how to modify and deploy an Enterprise CUI file with AutoCAD 2006.



Lee Ambrosius works for HyperPics LLC an AutoCAD Consulting/Training company located in Wisconsin, USA. He specializes in AutoCAD customization/programming and uses AutoCAD 2005/2006 and some of the AutoCAD-based vertical products. He can be reached via e-mail at [lee\\_ambrosius@hyperpics.com](mailto:lee_ambrosius@hyperpics.com). More information can be found at his website, at <http://www.hyperpics.com> or his blog at <http://hyperpics.blogs.com>.

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An Enterprise CUI file is no different than any other customization file except for how and when it is loaded.

# Working with Schedule Tables: Making Edits & Adding Formulas

In my previous article (*AUGIWorld*, Nov/Dec 2005), I discussed how to create a schedule table in Autodesk® Architectural Desktop 2006. Now that you know how to create a schedule table, how do you make changes to cell data or add a formula to a table? Let's look at how to edit table cells and use the Formula Property Definition worksheet to add a formula to a schedule table.

## Editing table cells

First, it is important to note that automatic property set data cannot be edited within a schedule table. Instead, you must edit the style, object, or other data directly to change the values of automatic property data. Also, if you are working in a table that schedules a drawing from an external source, you cannot edit table cells. You must go into the external drawing and edit the data there.

Now with that said, to begin editing a table cell, select the schedule table, right-click, and select Edit Table Cell. Next you will need to position the cursor over the cell you wish to edit and double-click. A dialog box will come up allowing you to edit data for that cell (see Figure 1). Make the necessary changes and click OK. If you wish to edit the value data for all instances of a property, select the border of the schedule table and enter a value for the selected property. With the Edit Table Cell command still active, hover over an item and you will get information pertinent to that item. This is important if you are not sure if the cell can be edited.

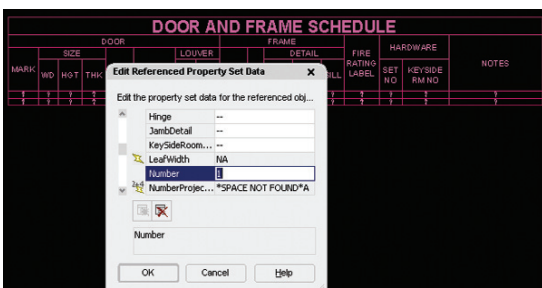


Figure 1

## Updating a schedule table

If you have edited an object or style directly in your drawing, you will need to update your schedule table in order for the information to update. You will notice after editing an object or style that a line appears through the schedule table, thereby indicating that an update is needed. To update the schedule table, right-click on the schedule table and select Update Schedule Table. You will notice that the changes you made to your objects are now reflected in your table.

## The Formula Property Definition worksheet

Formula properties have received an entirely new interface in ADT 2006. It is much simpler now to add complex formulas that contain VBScript code. The new dialog box also allows you to input sample values so you can test the validity of a formula directly within the Property Set. This saves a lot of time and reduces error trapping tremendously. Hats off to Autodesk on this one!

You can insert a formula into a schedule table at the property definition format stage by using the Formula Property Definition worksheet to construct the formula with VBScript code. After constructing your formula,

you can then insert sample values into your formula and evaluate the result to see if your formula works. This makes debugging your formula much simpler than with previous versions of ADT.

You can enter your formula and provide test values for the other properties it references right in the definition dialog box. It will do all of your debug-

ging right there. There is also a useful section that will add various VBScript command structures to your formula, which contains placeholders for parameters you will need to enter. You will notice that these are organized by type, making it easy to find what you need.

It is important to note that you can hover over an item to see a tool tip that displays what will be inserted, just in case you are not sure. If you have Internet access, you can right-click Help, which will take you straight to the MSDN Library help page for that command. This is very user friendly for beginners.

With all that said, go to the Format menu, select Style Manager and expand Documentation Objects. Next, expand Property Set Definitions and select the property set definition you wish to change. Select the Definition tab and then select

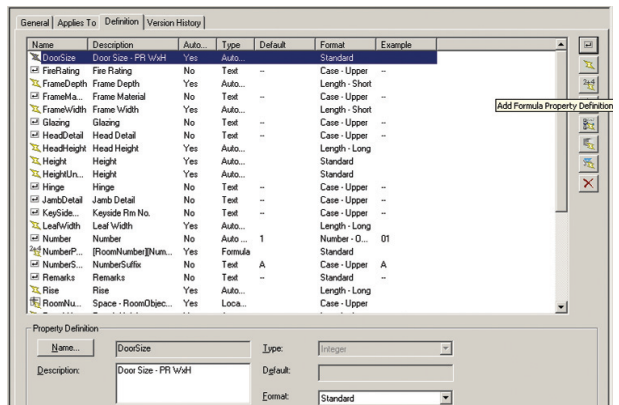


Figure 2

the button to add a formula (see Figure 2). The Formula Property Definition worksheet will open (see Figure 3). Enter a name for the formula property. If you do not want to use the formula as the description of the property, clear Use Formula For Description.

Now you can enter the formula. If you want to enter values, click in the Formula pane and type the values. If you want to use the value of another property definition in the formula, locate and double-click

the definition in the Insert Property Definitions list. This will bring in the other property definition for use in your formula. If you want to use a VBScript function, locate and double-click the function in the Insert VBScript code list. If you want to evaluate the formula as a VBScript function, enter RESULT anywhere in the formula. When you are done, select OK at the bottom.

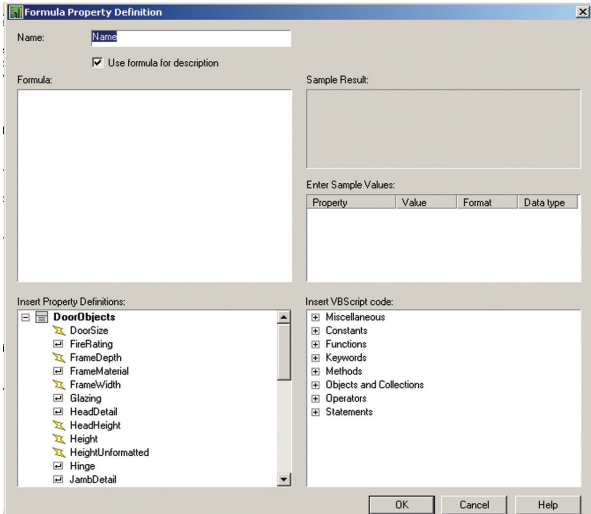


Figure 3

It is important to note that the property definitions that are available for use in the

formula must be applied to the same objects as the property set definition that contains the formula. The names of the property definitions used within the formula will be displayed in brackets, such as {Height}. If a property definition belongs to a property set definition different than the one that contains the formula, that name will be displayed as well, such as {DoorObjects:Width}. It is also important

to note that typing the name of a property definition directly into the formula string, or copying and then pasting between formulas, will display the property definition as normal text. Property values must be selected from the list in the Insert Property Definitions pane for them to be inserted correctly.

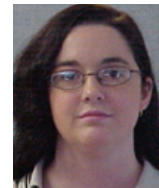
To change the name of the property definition, select Edit Formula on the Definition tab of the Style Manager, and then edit the name in the Formula Property Definition worksheet. If Use Formula For Description is not selected, then select OK

and enter the description under Property Definition on the Definition tab of the Style Manager. For formatting, you can select a property data format to specify the method used to display the data that is included in the definition. This format will be applied to the final result of the evaluated formula.

The format you select will become the default format of a column when this property is added to a schedule table style. It can be changed at any time. The example area of the dialog box shows how the default value is displayed using the selected format. Select OK and you are done.

### The more you know

Schedule tables and formulas are useful tools. The more we know how to use them, the more we can do with them. This feature has continued to improve over the last few releases of Architectural Desktop and I look forward to seeing what improvements Autodesk makes next.



Melinda Heavrin is a CAD Coordinator for Norton Healthcare in Louisville, Kentucky. She can be reached for comments and questions at [melinda-heavrin@alltel.net](mailto:melinda-heavrin@alltel.net).

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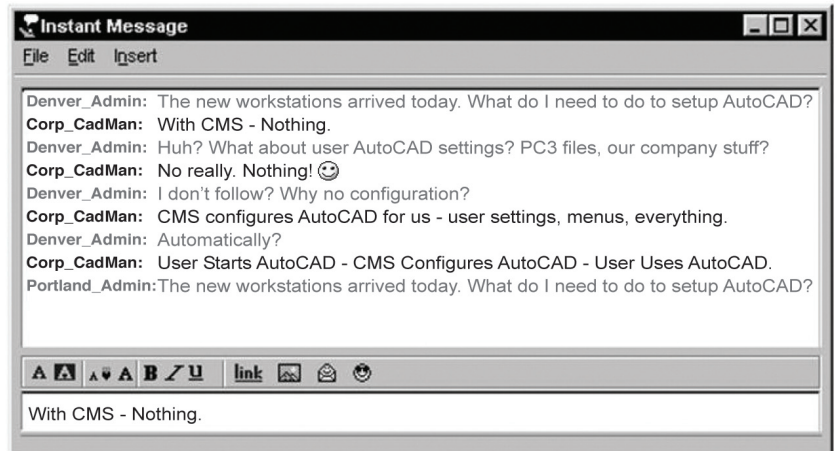
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# Discover the Power of ObjectARX

AutoCAD® has become the most powerful and widely used CAD platform, but most users use it only for their own job purposes and don't want, or don't even try, to expand its power.

Many beginners and advanced users create their own small routines using AutoLISP or VBA customization tools. These platforms are intended to do this, but if users would like to expand their skills and create "state-of-art" applications, they definitely should use ObjectARX.

ObjectARX was officially released with AutoCAD R13 and is based on C++ language, which is exactly what scares users and makes them stay away! ObjectARX is so powerful that Autodesk itself started to use it to build all AutoCAD-based verticals such as Mechanical Desktop and Architectural Desktop. The ObjectARX SDK can be downloaded from Autodesk and it comes with some great samples. In this article I will show just one great thing you can do using ObjectARX.

## Basic concepts

AutoCAD is structured as a database where you have specific places to store "things." Basically there are three types: Entities (objects with graphics), Containers (objects that store other objects), and Objects (objects without graphics). The database has several types of containers to store layers, blocks, linetypes, etc. The basic database structure is shown in Figure 1.

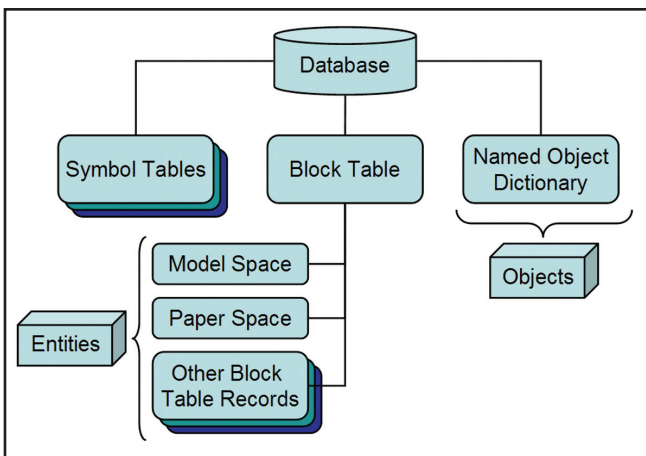


Figure 1: AutoCAD Database

Each object has its own required data for its creation and the proper container in which it is to be stored. Basically what you have to do is to instantiate the desired object, set its properties, store it inside the proper container, and then close its memory pointer. The example below shows how to create a LINE entity.

```
// create two points and the line
AcGePoint3d startPt (1.0, 1.0, 0.0);
AcGePoint3d endPt (10.0, 10.0, 0.0);
AcDbLine* pL =
new AcDbLine (startPt, endPt);
// open the proper entity container
AcDbBlockTable* pBT = NULL;
AcDbDatabase* pDB =
acdbHostApplicationServices()->
workingDatabase();
pDB->getSymbolTable(pBT,AcDb::kForRead);
AcDbBlockTableRecord* pBTR = NULL;
pBT->getAt(ACDB_MODEL_SPACE, pBTR, AcDb::kForWrite);
pBT->close();
// now, add the entity to container
AcDbObjectId Id;
pBTR->appendAcDbEntity(Id, pL);
pBTR->close();
pL->close();
```

This code will create a LINE from point (1,1,0) to (10,10,0) using current layer.

## Application overview

ObjectARX applications are basically composed of one or more DLL modules. These DLL may use MFC and other VC++ compatible libraries. In fact, ObjectARX separates the concept of interface and custom classes, which will allow you to create the so-called "object enablers" for your applications. The interface mod-

ule has the ARX file extension and the class module has the DBX file extension. Obviously, complex applications will require a much more sophisticated project structure.

Your application will register new commands, implement new classes, and offer rich integration with the AutoCAD interface. Once your application is ready you may load it inside AutoCAD using APpload or ARX commands. Once it is loaded it can communicate with the AutoCAD database, interface, command prompt, or use MFC dialogs.

The process to create an ObjectARX project is not quite this simple and to avoid this extra work the SDK provides an ARXWizard. This wizard will help you to build your project's skeleton and speed up your development. To build ObjectARX applications compatible with AutoCAD 2004 and above you will need to use Visual Studio .NET 2002. If you compile your applications with ObjectARX 2004, it will also run fine inside AutoCAD 2005 and 2006.

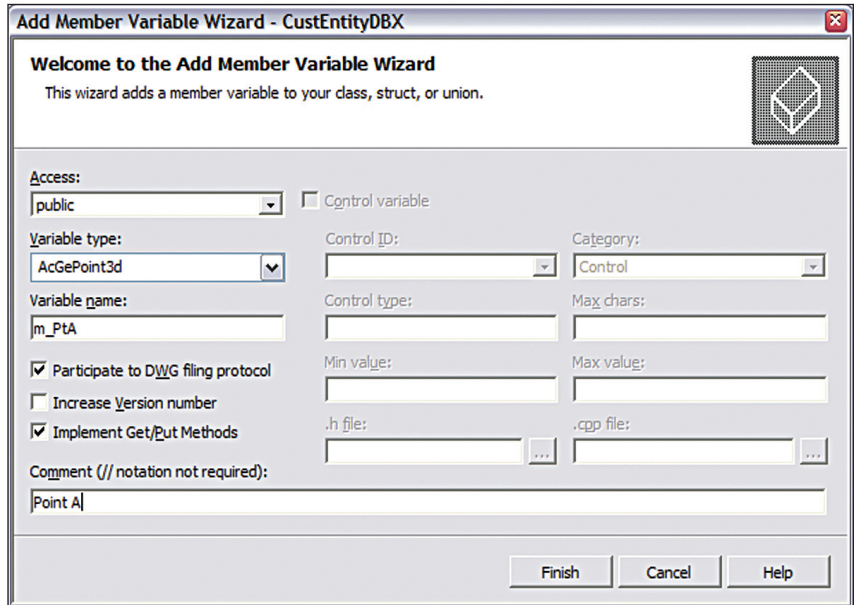


Figure 3: Member Variable Wizard

## Creating a custom entity

Now we will create a simple custom entity, which will help you see the potential of ObjectARX. We will use the ARXWizard to simplify the process and I will also omit some comments and security for code brevity.

Using VS2002, create a Blank Solution called CustomEntitySample. After that, add two ObjectARX projects. The first one will be an ARX module called CustEntityARX and the second will be a DBX module called CustEntityDBX. Enable MFC extensions in both projects. Make the ARX project depend on DBX by right-clicking on ARX project, selecting Project Dependencies, and enabling DBX project on the list.

Now, go to the ARXWizard toolbar and click on Autodesk Class Explorer. Right-click on CustEntityDBX node and select Add ObjectDBX Custom Object (see Figure 2).

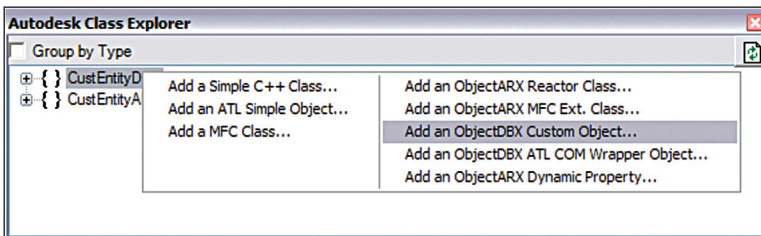


Figure 2: Autodesk Class Explorer

A dialog will appear asking for custom object information (Names page). Type MyCustomEntity as the class name and set AcDbEntity as base class. Go to the Protocols page and enable both Osnap and Grip-point protocols. Now you should be able to build your project without getting errors.

Again open the Autodesk Class Explorer and go to CustEntityDBX project. Select the MyCustomEntity node, right-click on it, and select Add Variable. A Member Variable Wizard dialog will appear (see Figure 3)

We will add four AcGePoint3d variables to be able to build the graphical representation of our custom entity using four corners of a rectangle. The variables names will be: m\_PtA, m\_PtB,

m\_PtAB and m\_PtBA. Enable Participate to DWF filing protocol option, disable Increase Version number, enable Implement Get/Put methods, and fill desired comments for each variable.

## Custom entity's drawing

The entity's drawing is made through worldDraw() and viewportDraw() methods. In this case, we won't provide viewport-dependent graphics so we will use only worldDraw() method. Locate it at CPP file and add the following code:

```
Adesk::Boolean MyCustomEntity::worldDraw (AcGiWorldDraw
*mode) {
```

```
    assertReadEnabled();
    // Bounding Polyline, mark 2, color red
    AcGePoint3d pts[4];
    pts[0] = m_PtA;
    pts[1] = m_PtAB;
    pts[2] = m_PtB;
    pts[3] = m_PtBA;

    mode->
    subEntityTraits().setSelectionMarker(1);
    mode->subEntityTraits().setColor(1);

    mode->geometry().polygon(4,pts);
```

```
// Entity's Text, mark 2, color bylayer
mode-> subEntityTraits().setSelectionMarker(2);
mode->subEntityTraits().setColor(256);
```

```
AcGiTextStyle style;
style.setFileName("txt.shx");
style.setBigFontFileName("");
style.setTextSize(25);
style.loadStyleRec();
```



```
AcGePoint3d txtPt ((m_PtB.x+m_PtA.x) / 2.0,
(m_PtB.y+m_PtA.y) / 2.0, m_PtA.z);

CString strText = "Any text";
mode->
geometry().text(txtPt, AcGeVector3d::kZAxis,
(m_PtAB-m_PtA), strText, strText.GetLength(),
Adesk::kFalse, style);

return Adesk::kTrue;
}
```

## GRIP points

Our custom entity will provide handy grips for users. Grips are implemented by `getGripPoints()` and its movement is specified by `moveGripPointsAt()`. Locate these functions and add the following code:

```
Acad::ErrorStatus
MyCustomEntity::getGripPoints (
AcGePoint3dArray &gripPoints,
AcDbIntArray &osnapModes,
AcDbIntArray &geomIds) const
{
assertReadEnabled ();
gripPoints.append(m_PtA);
gripPoints.append(m_PtAB);
gripPoints.append(m_PtB);
gripPoints.append(m_PtBA);
gripPoints.append(AcGePoint3d((m_PtB.x+m_PtA.x)/2.0,(m_PtB.
y+m_PtA.y)/2.0,m_PtA.z));
return Acad::eOk;
}

Acad::ErrorStatus MyCustomEntity::moveGripPointsAt (
const AcDbIntArray &indices,
const AcGeVector3d &offset)
{
assertWriteEnabled ();
for(int i=0;i<indices.length();i++) {
int idx = indices.at(i);
if (idx==0 || idx==4) m_PtA += offset;
if (idx==1 || idx==4) m_PtAB += offset;
if (idx==2 || idx==4) m_PtB += offset;
if (idx==3 || idx==4) m_PtBA += offset;
}
return Acad::eOk;
}
```

To enable a grip point you just need to add desired points to the passed in array. To react to a grip selection and movement you need to apply a transformation vector to each point when it is selected. As your entity may contain several grip points, they are indexed by the order in which you added them to the array. The same index must be used to apply the transformation.

## OSNAP points

Another important feature you may want to add to a custom entity is related to precision. Object Snap will allow users to acquire certain points of your entity.

In this example we will implement three Object Snap points: EndPoint, MidPoint, and Center. This is done using the `getOsnapPoints()` method as follows:

```
Acad::ErrorStatus
MyCustomEntity::getOsnapPoints (
AcDb::OsnapMode osnapMode,
int gsSelectionMark,
const AcGePoint3d &pickPoint,
const AcGePoint3d &lastPoint,
const AcGeMatrix3d &viewXform,
AcGePoint3dArray &snapPoints,
AcDbIntArray &geomIds) const
{
assertReadEnabled();
switch (osnapMode) {
case AcDb::kOsModeEnd:
snapPoints.append(m_PtA);
snapPoints.append(m_PtAB);
snapPoints.append(m_PtB);
snapPoints.append(m_PtBA);
break;
case AcDb::kOsModeMid:
snapPoints.append(m_PtA + ((m_PtAB - m_PtA ).length() /
2.0) * ((m_PtAB - m_PtA ).normalize()));
snapPoints.append(m_PtAB + ((m_PtB -
m_PtAB).length()/2.0)*((m_PtB - m_PtAB ).normalize()));
snapPoints.append(m_PtB + ((m_PtBA - m_PtB
).length()/2.0)*((m_PtBA - m_PtB ).normalize()));
snapPoints.append(m_PtBA + ((m_PtA -
m_PtBA).length()/2.0)*((m_PtA - m_PtBA ).normalize()));
break;
case AcDb::kOsModeCen:
snapPoints.append(AcGePoint3d(
(m_PtB.x+m_PtAB.x+m_PtBA.x+m_PtA.x)/4.0,(m_PtB.y+m_PtAB.y
+m_PtBA.y+m_PtA.y)/4.0, m_PtA.z));
break;
}
return Acad::eOk;
}
```



To implement EndPoint, we just need to add our entity's four key points. To MidPoint and Center we need to perform some algebra with points to calculate them.

## Transformation

Transformations can be applied to our custom entity and this is done using the transformBy() method. Open the Autodesk Class Explorer again, Select MyCustomEntity node, and expand base class node (AcDbEntity). Scroll down to transformBy() method, right-click it, and click on "Implement Base Class Method." The wizard will add it to your entity's class. Open the CPP file and add the following code:

```
Acad::ErrorStatus
MyCustomEntity::transformBy(
const AcGeMatrix3d &xform)
{
assertWriteEnabled();
m_PtA.transformBy(xform);
m_PtAB.transformBy(xform);
m_PtB.transformBy(xform);
m_PtBA.transformBy(xform);
return Acad::eOk;
}
```

In this case we just need to apply the same passed in transformation matrix to all of our key points. The result will be the whole entity transformation.

## ARX project

The last step is to create the custom entity from the ARX module of our application. The entity's class is exported from DBX module and this allows us to use it from ARX module. To ensure that the ARX project recognizes the custom entity, we need to include the necessary header at StxAfx.h file of ARX project. Open it and add the following include and the end of file:

```
#include "..\CustEntityDBX\MyCustomEntity.h"
```

Now, at Solution Explorer tree, select the ARX project and click on the "a>" icon at ARXWizard's toolbar. Add a new command called MYCUSTENT setting it as Modal type. The ARXWizard will add, inside acrxEntryPoint.cpp, a function called CustEntityARX\_MyCustEnt inside class CCustEntityARXApp. Add the following code to it:

```
static void CustEntityARX_MyCustEnt(void) {
// Input information
ads_point pt1,pt2;
if (acedGetPoint(NULL,"Set first corner:\n", pt1) !=
RTNORM) return;
if (acedGetCorner(pt1,"Set second corner:\n", pt2) !=
RTNORM) return;
MyCustomEntity *pEnt =
new MyCustomEntity();
pEnt->put_m_PtA (asPnt3d(pt1));
pEnt->put_m_PtAB (AcGePoint3d (pt2[X], pt1[Y], pt1[Z]));
pEnt->put_m_PtB (asPnt3d(pt2));
pEnt->put_m_PtBA (AcGePoint3d (pt1[X], pt2[Y], pt2[Z]));
// Post to Database
AcDbBlockTable *pBlockTable;
```

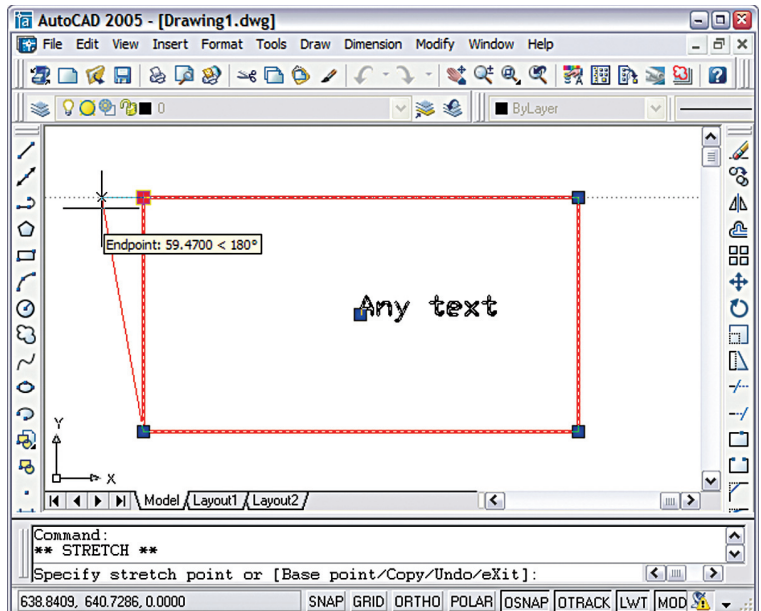


Figure 4: Custom Entity

```
acdbHostApplicationServices()->
workingDatabase()->getSymbolTable (pBlockTable,
AcDb::kForRead);
AcDbBlockTableRecord *pBlockTableRecord;
pBlockTable->getAt(ACDB_MODEL_SPACE,
pBlockTableRecord,AcDb::kForWrite);
pBlockTable->close();
AcDbObjectId retId = AcDbObjectId::kNull;
pBlockTableRecord->appendAcDbEntity(retId, pEnt);
pBlockTableRecord->close();
pEnt->close();
}
```

This procedure is much like the one we presented to create an AcDbLine, but this time you are using the custom entity and calling its own methods.

## Run the application

Now you should be able to compile and build the whole project without errors. After this, open AutoCAD and fire command APPLOAD. Select first the DBX module and load it, then select the ARX module. Fire the MYCUSTENT command and create your entities. Test MOVE, ROTATE, GRIP, and OSNAP features (see Figure 4).

## Explore the power of ObjectARX

This article was created to show you how to explore the power of ObjectARX. This is only a small sample of what you can build with ObjectARX. There are many features you can add to your applications and this will allow you to build great solutions for specific industry segments.



*Fernando Malard is a civil engineer with extensive experience in structural engineering, software development, database design, system engineering, and ObjectARX. He can be reached at [fpmalard@hotmail.com](mailto:fpmalard@hotmail.com).*

# The Devil Is In The Details

## *The Revit Platform Meets CAD*

**A**s I write this first Autodesk® Revit®-focused column for *AUGIWorld* in 2006, Autodesk University 2005 is still some weeks away. Having moved from the U.S. to Australia in October, I find myself unable to attend AU for the first time in years. I send my somewhat belated congratulations to everyone who attended or presented at class sessions, and took advantage of the unparalleled opportunity for networking that is AU.

I recently attended an Autodesk Developer Network conference in Melbourne, at which I learned that the Australian market is adopting Revit at a higher rate, relatively, than the U.S. That being the case, I look forward to meeting Revit users all over this country as well as communicating with Revit's lively users worldwide on the AUGI forums.

With this issue of *AUGIWorld*, Revit-related issues will be explored in a regular feature article. Each time out we will present an article by an experienced user, with myself as coordinating editor. I have already been contacted by a number of serious Revit experts ready to contribute material, so we can look forward to a steady flow of excellent information on both Revit Building and Revit Structure in the coming year.

There are two things I would like to share from the Developer Day conference. First, Revit Mechanical is under development, so those of you who work with electri-

cal, plumbing, and HVAC will have tools on the Revit platform in the foreseeable future. Second, and this will lead me into the main topic for this month's column, detailing in Revit will be a focus for improvement in the next release.

### Details—how much CAD to put in your BIM?

For those not familiar with design software acronyms, BIM—Building Information Modeling—creates 3D models based on defined objects that correspond to real-world construction techniques, whereas CAD—Computer Aided Design/Drafting—uses lines, arcs, circles, and the like to represent edges of objects or components. BIM applications, of which Revit is a prime example, hold many times the information of a CAD file, even though the representations—plans, elevations, and sections—may look exactly the same. The value of BIM lies in the ease with which a complex design can be populated, revised, and reported on (via schedules and data extracts). Not everything in a building design is worth modeling, however, and making the effort to represent too much detail in 3D can be counterproductive. Revit provides mechanisms for creating and fleshing out the 2D views that will always be part of construction documents.

Those who come to Revit from a CAD background may find that the tools feel awkward or insufficient compared to those they are accustomed to using. Bear in mind that Revit is a modeling program with drafting tools included, not a drafting program that can provide 3D views. If you know what you need to represent, you can almost always find a way to draft it accurately.







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ly. The basics of the drafter's toolkit—line styles, line weights, patterns, snap points, offsets, arrays and mirror planes—are all available.

Revit's creators knew from the beginning that the wealth of 2D CAD file data in every company's archive needs to be mined many times over. Revit recognizes properties of AutoCAD® and MicroStation entities and will accept files as live links or static imports.

Imports will explode into Revit entities—never perfectly, but when has that ever been the case? You don't have to be an old-timer to remember the blood, sweat, and tears involved in DXF transfer. For most efficient reuse of CAD files, the trick is to prepare files correctly in their native format so that Revit can display them as you want with the least effort.

## How much does a line weigh?

CAD applications set lineweights in a number of ways, not all of which are visible to the user. Color maps to a line thickness when plotted. Lineweight can be assigned by entity or layer, and may or may not display. AutoCAD polylines can be assigned visual thickness that will plot, but which is not geographic (you can't snap to the apparent corner of a wide polyline). Revit will recognize lineweights assigned by layer or entity and maps imported colors to lineweights, but can't read polyline thickness. In the illustration shown in Figure 1, the thick AutoCAD polylines (upper left) have width but not lineweight, so they don't display correctly in Revit (upper right), while the polylines that do have assigned lineweights (lower left) that are not set to display in AutoCAD import correctly into Revit (lower right).

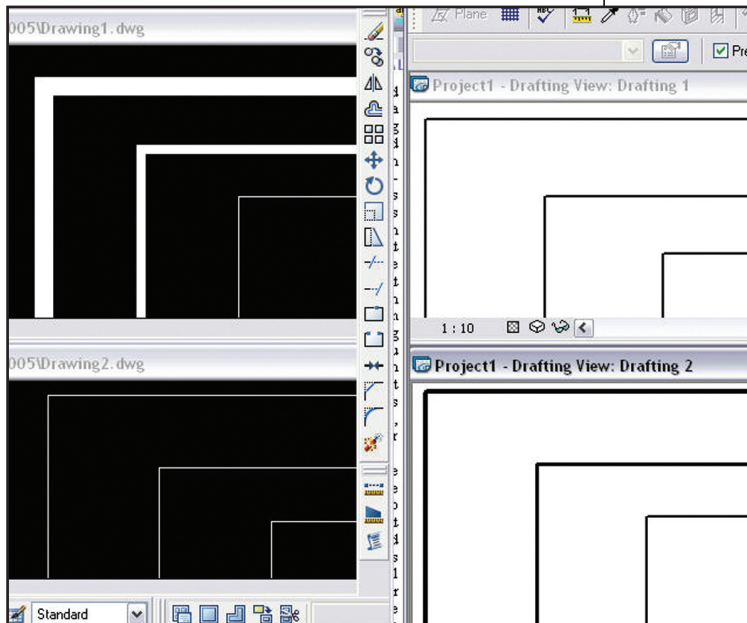


Figure 1

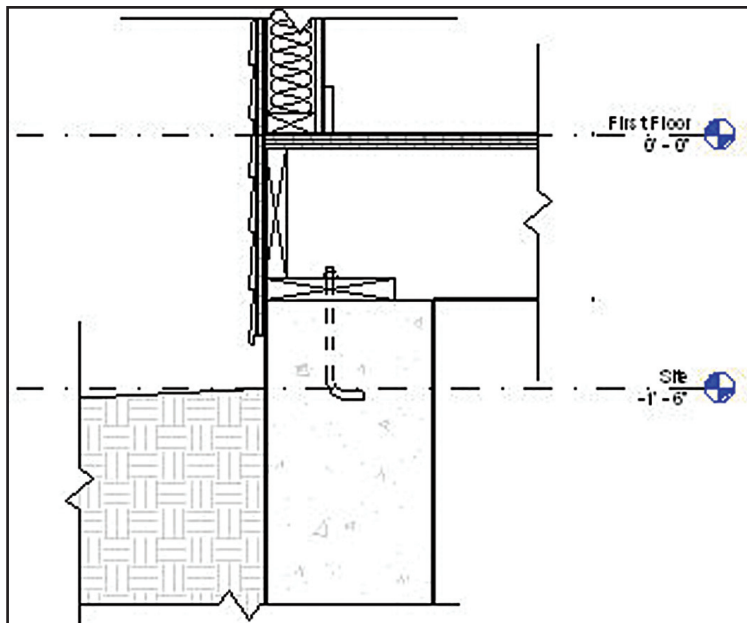


Figure 2

Linetype scale in CAD files is a manual setting—the user needs to correlate it with viewport scale; Revit scales non-continuous lines automatically. For best results, make CAD file linetypes look correct in Model Space (or the equivalent) and then Revit will accept and display them consistently.

By the same token, if you have entire pages of standard CAD details at differing scales set up to plot correctly in Paper Space layouts, it will be worth the time to arrange them in Model Space in a single

file for import into Revit. Revit's Viewports do not have snap points on their edges nor do they align using entity points within the Viewports, so they are not really suited for arranging 15 or 20 to fit in a tight arrangement on a sheet.

## Is there a draft in here?

Revit's tools for detailing include more than simple CAD import. 2D drafting tools include lines (plus arcs, circles, splines, ellipses, and polygons), reference planes, dimensions, text, filled regions (hatch), pre-drawn detail components, and symbols. The library of pre-drawn 2D material includes repeating elements such as brick and insulation, and a useful break line symbol that eliminates trimming lines at the edges of a detail view (see Figure 2).

As always in Revit, views are important, and two types are used for detailing. Callouts are efficient for displaying restricted views of the model that the user can augment with drafting, as shown in the illustration. Callout tags are smart and can be referenced in many places, cutting down on errors when coordinating sheets. Drafting views are not connected to the model, so the user can

create illustrative material using 2D drafting techniques rather than trying to model at an inappropriate level of detail. Drafting views are the place for imported or linked CAD material. See you next time.



*Christopher Fox is a freelance architectural drafter, educator, author, and AUGIWorld contributing editor. He can be reached at [lcfox@archimagecad.com](mailto:lcfox@archimagecad.com).*

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# On The Back Page



David Kingsley

## Product Lifecycle Management

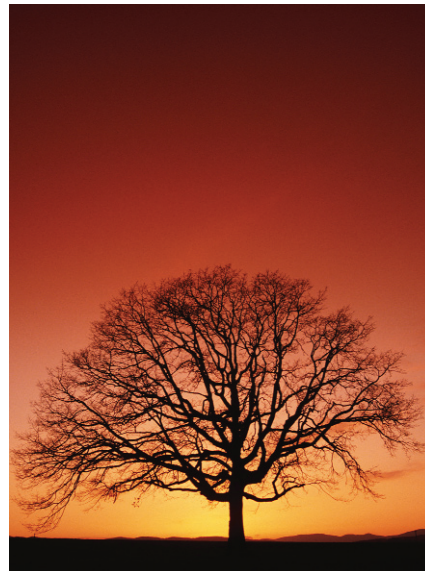
I grew up outside of Ann Arbor, Michigan, in a semi-rural setting. My dad grew up in northern Michigan during the depression (1930s). As a child, he hunted and fished to eat. As a young man, he was a real lumberjack. Shortly after serving in World War II, at the age of 26, he bought 10 acres of land with a medium-sized barn on it with the vision of converting it into a house. I can honestly say that I grew up in a barn. My earliest memories are of working with my dad on the house. I became a “tool-caddy” as soon as I was able to understand orders and identify the tools he asked for. I remember finishing the upstairs so that we could each have our own bedrooms. When I was 9 years old, my dad and I planted a maple tree in the front yard. I remember to this day his instructions: “I want you to come back here whenever you can for the rest of your life and visit this tree so that you know how long it takes for a tree to grow.”

A few miles away was the seminal “Willow Run Plant” (Google: willow run bomber plant). From 1940-1944, the low lying wetland, bisected by a creek lined with willow trees, was converted by Henry Ford and other industrial magnate partners into a manufacturing facility unlike any the world had ever seen. Ford applied his assembly line processes to manufacture “B-24 Liberators,” a four-engine heavy payload bomber that played a decisive role in Europe during World War II. Each B-24 comprised almost a half-million parts. At its peak, Willow Run produced “a bomber an hour” and more than 8,600 planes by the end of the war.

For our mechanical engineer readers, the “just in time” process was born at Willow Run. The development of “GD&T,” or more formally, “ANSI Y14.5 Dimensioning and Tolerancing” took place here. “Rosie the Riveter” built B-24s at Willow Run, establishing firm footing for women in the workplace (Google: Rose Will Monroe). Today, Willow Run is still one of the nation’s largest cargo airports and virtually all General Motors automatic

transmissions are built in the old bomber plant. I know, I worked there in the tool design department.

I graduated from high school in the summer of 1969. That fall, General Motors announced the building of a “World Parts Distribution Center” adjacent to Willow Run. Soon, GM agents were knocking at our doors with cash offers for the house and land. They were quite unscrupulous in their tactics, preying on the fears of relatively simple people. In a matter of days



they purchased a swath of land about a mile wide and four miles long, which included my family home. My dad held out for a while, but resistance was futile. By Christmas we had relocated to a far inferior house and it was never my home. Our family was traumatized by having our lives and dreams uprooted beyond our control. In this regard, I empathize with those displaced by Katrina.

Only a small portion of the GM facility was ever built. Most of the houses were rented out for many years after, including ours. One by one, houses disappeared. But ours, with 8" and 12" barn beams throughout, remained standing alone, occupied, and maintained. When in Michigan I always make time to drive by and look at the old house and my tree, as I last did in June 2005.

While many of you were preparing for Autodesk University 2005 in Florida, I went to Michigan for Thanksgiving. While driving over to look at my tree, I heard on the radio that GM was announcing huge cuts in its workforce and closing several plants, including the World Parts Distribution Center at Willow Run. A few minutes later when I arrived at the old house, I thought I was having a senior moment, because apparently I drove right by it. I guess the forest was closing in on it. I turned around and drove back cursing at myself for missing it again. It took a third pass for me to realize that the house was gone.

But my tree was still standing! There were cars and people under it. A thirty-something man, whose kids were putting around on dirt bikes in the same field where I used to do the same, told me that the house had been torn down some time in October. He also told me he “knew the guy who grew up there.” I learned that one family had lived there since 1970. An entire new family had been born and raised there after we left. I also learned that the land had been turned over to the township and that a new high school is going to be built there.

I had a flash. My tree had an orange ribbon nailed to it, not a good sign. My rental car had a GPS so I took a coordinate reading. When the high school is built, I’m going to return to that coordinate and see what is there. But first, I’m gonna drive my old pickup to Michigan, rent a chainsaw, and bring the trunk of my tree to Colorado. I have a small wood shop and there is a sawmill nearby. I’m going to make some furniture. Kinda poetic, eh?

In an earlier column, I stated that Ford hybrid drives use Toyota components. A reader (and apparently a Ford employee!) brought to my attention that Ford has developed its own hybrid drive. I stand corrected.

*David Kingsley served from 1999-2004 on the AUGI Board of Directors and is the Director of Electrons at CADPlayer Web Courseware. He can be reached at [djkingsley@cad-tv.com](mailto:djkingsley@cad-tv.com)*



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