

January/February 2009



AUGIWorld

The Official Publication of Autodesk User Group International

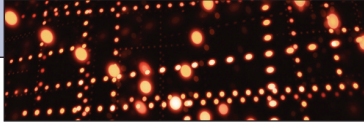
It's Easy Being Green

Tools for Sustainable Design Using Revit

Plus...

- *Autodesk Impression
Tips @ Tricks*
- *Redefine your
Collaboration Workflow*

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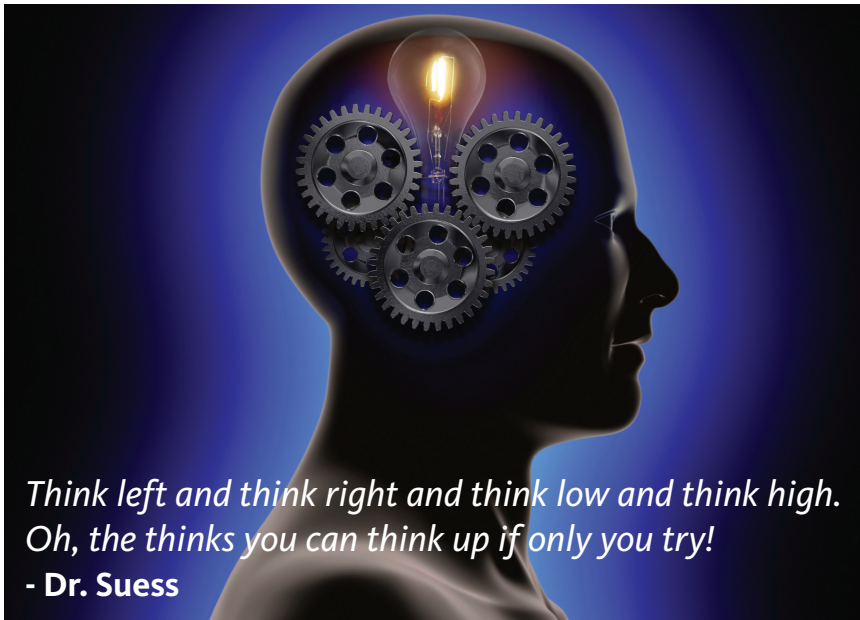
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The CAD Manager



Thinking about Thinking



*Think left and think right and think low and think high.
Oh, the thinks you can think up if only you try!*
- Dr. Suess

When you have the time to think about something, what do you think about? Actually, *how* do you think about it? When you are called on to make a decision, how do you frame the question? How do you organize and process all the input surrounding the decision and process the impact that a decision may make? When is a decision a big deal and when is it not?

“Don’t bother me... I’m thinking” is a classic line in the perennial favorite movie “A Christmas Story.” Ralphie is trying to figure out how to get the “special” Christmas gift while waiting in line to talk to Santa. We all think, but do we do it with a process in mind? Most times we do, but we don’t realize that we are actually using a process to figure out our answers and plans. So let’s take a look at one process that may sound familiar because we all use some form of this.

Lateral thinking

Edward de Bono was born May 19, 1933, in Malta. He is a physician, author,

inventor, and consultant. He is best known (if you have ever heard of him) as the originator of the term “lateral thinking” way back in the late 1960s. He believes that the human brain thinks in a number of distinct ways that can be identified and structured into a process of thinking. He claims that most problems in the thinking process come from people reaching a solution too fast and then acting on the wrong assumptions.

Lateral thinking is something that we all have done. We do it when we look at something from a different perspective. We break out of our normal pattern of thinking and jump “laterally” to another viewpoint for thinking. The new idea that is the result of a lateral jump may not always be a helpful one, but when a good idea is uncovered in this way it usually becomes obvious to all.

Here are some methods for applying lateral thinking.

Random Entry: Think about the problem or design from a totally disconnected

and random way. Substitute one thing for another.

Example: What if our design for this car was more like a boat? If we were designing a boat, what would we do different?

Provocation: Declare the usual perception out of bounds, or provide some provocative alternative to the usual situation under consideration.

Example: Everyone knows what our CAD standards cover. Let’s think about what they *don’t* cover.

Challenge: Simply challenge the way things have always been done. There may not be anything wrong with the current situation, but you can stimulate thinking by taking a strong look at the opposite perspective.

Example: What if we did not have a CAD standard? People could just do what they want to do. They would be faster because they would not have to think about standards.

Suspending Judgment: Waiting to critique a solution until you have thought it through. Do not throw out a possible solution too fast, even if it looks like it will not work.

Generate Alternatives: Set up a quota for ideas. Do not stop thinking until you have enough ideas to toss around. Many times people stop thinking when they come up with a “good enough” option.

Using some of these techniques will help stimulate thinking, but that is not the extent of de Bono’s structuring of the thinking process. He continued to develop more ways of working through issues.

Let’s think about this

Back to my opening overview of de Bono’s perspective on the way we think. He postulates that the human brain naturally thinks that that which is out of the ordinary is dangerous. In the animal kingdom, that which does not fit into the normal pattern of “the jungle” should be feared. He con-

nects that to how we humans think and how we avoid something that is outside our normal bounds of thinking. By stretching those boundaries or eliminating them, we gain better insight and can achieve greater levels of thinking.

In the mid 1980s, de Bono divided the thought process into six categories. When you are thinking about something, he feels that you are doing one of the following:

- Neutrality (white) – Gathering the facts; pure collection of data and information
- Feeling (red) – Defining gut feelings, not necessarily based on anything
- Negative judgment (black) – Looking for what does not belong; what does not fit
- Positive Judgment (yellow) – Thinking about the positive outcomes
- Creative thinking (green) – Thinking outside the box (what “might” happen)
- Process control (blue) – The process of thinking itself

In his process, de Bono calls them “Thinking Hats” that we wear. Each one has a value and should be considered when processing any decision. He urged people to actually put on colored hats to force themselves to think about one item at a time. I am not into “cute little tricks” like that, but that’s just me.

Six thinking hats

Let’s take these one at a time and see how they can be applied to the decision-making process of a CAD manager. There is no particular order to these; however, some come before others logically. If you move from one hat to another, there is no rule that limits you from revisiting one that you have already passed through. In fact, I think that you will randomly apply any and all of these at any given time and be doing them more than one at a time. In a team environment, you may have different people wearing different hats. Not everyone will have the same hat on at the same time.

The white hat – gathering data

This is usually the first step in most decision processing. You are just collecting information. Do not make judgments on the info you receive, just collect it. Don’t start throwing out info with which you don’t agree. Keep it all.

Key questions to ask in this process: What data is missing? When do we have to make a decision? Who needs to be involved?

The red hat – feelings and emotions

Leaving out feelings, impressions, and intuition in any decision-making process can cause failure. Investing too much emotion in the process can also bring failure.

It has to be balanced. You always bring in your initial feelings and perspectives. This process just exposes them. There are unshared agendas, negative slants, fearful leanings, selfish preferences, and others that impact any solution. By getting them out on the table, you can learn from them and prevent skewed results.

Key questions: How does this make people feel? Are you comfortable with this? Have we forgotten about the people factor? Will this solution empower people?

The black hat – critical judgments

Some people live with this hat on. It is the negative perspective. It allows people to nitpick ideas. It allows them to attempt to throw things out. It looks long and hard at the possible negative outcomes. You cannot avoid this and keep the rose-colored glasses on. You have to address the negative fallout. But you should not let it rule the day with unfounded negativism. You could “what if” yourself to death with possible negative outcomes.

Try to keep to the “probable” outcomes, with higher percentages of chance. If there are overwhelming negative outcomes, then that defines your solution. A few negatives do not. People will tend to want to put this hat on many times. If you are brainstorming ideas, set this hat aside.

Key questions: Will we lose money doing this? Does this really help make things better? Are we changing things just because we can? Do we have any proof that our problem will stop happening if we do this?

The yellow hat – positive thinking

People identify the positive outcomes. This balances the black hat. Again, do not allow wishful thinking to come into play. Positives need to be balance with supporting facts, not just wild fantasies. Big dreams may cloud your judgment because they are very appealing. Stay grounded, but positive.

Key questions: (These tend to come across as statements and not questions.) If we do this, then we will no longer have to deal with this problem, right? Moving from here to there is achievable. This will make us more profitable. It will definitely increase quality.

The green hat – creativity and alternatives

Let’s get creative – slam on that green hat. This is where the juices start to flow; people get excited and start thinking outside the box. Some blank stares are possible as people work into this mode. The wheels are turning. Let them process. Avoid throwing “black hat” negative thought into the face of a creative idea. Do not critique the ideas while you are trying to generate them.

Key questions: What if we did this for free? What if there were no limit on our time? Could we have more than just the three options? What could we do if we spent a little more money? What if we flipped the part the other way?

The blue hat – the big picture

Never forget the big picture. Sometimes we focus so much on a problem or an idea and forget where it all fits into the grand scheme of things, even the process of the decision you are making. This is the hat that frames the process. You agree on the ground rules of the discussions. Every once in a while you step back to see where you are. You slow down and regroup. You summarize. Then you look to see how this fits in the overall mission of the firm. Keep stepping back farther and farther to see if it will work.

Key questions: Where are we now? What have we determined? Who thinks we are headed in the right direction? Are we forgetting something? Will our bosses be happy with this? Is it time to take a break? Have we thought of everything?

Conclusion

Whether you are working in teams or working alone, using de Bono’s “hat methods” can help you have a well-rounded approach to working through ideas, plans, or troubles and moving toward resolution. By taking a measured approach, you gain the confidence that you have been thorough and covered everything.

This method offers unlimited groupings and processing workflows. By mixing and matching the hats, you can move quickly toward resolution. For example, quick solutions that impact few can move with speed through some of the steps and avoid others. Longer range and greater impact decisions will call for a more methodical progression in and out of each area. By keeping them all in mind, you are sure to enhance your ability to come to the best conclusion of any decision process.

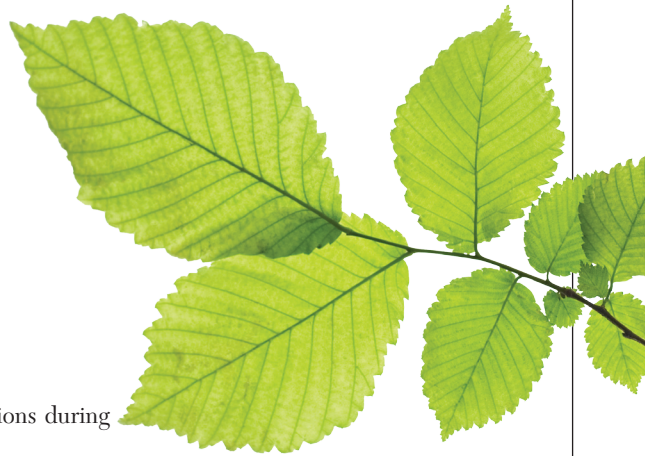


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It's Easy Being Green

*Tools for Sustainable
Design Using Revit*





Editor's note:

With the recent plunges in financial markets, world economies in general, and the construction industry in particular, you don't have to be a tofu-eating greenie to wonder about the immediate future for sustainable design efforts. Will uncertainty about construction financing lead to watering down of efforts to design and create buildings that use less energy? It's encouraging that the new US administration has included substantial sums in proposed financial stimulus legislation to upgrade housing and federal government building energy performance. The elusive goal of less dependence on fossil fuels has not been abandoned; far from it. There will be no return to the days of cheap construction with no concern about building performance and energy consumption. Designers will only face more stringent energy performance requirements in the very near future. In this column we examine some of the new generation of building performance analysis tools that work with Revit®.

--Chris Fox

What does it mean to be green?

It's one thing to design buildings efficiently and another task entirely to design efficient buildings. Make no mistake—as designers your job will include, in the very near future, either collecting or generating performance information on your buildings. Here are some of the questions you will be called on to answer.

Other than following codes, how do you know that your building design will keep the people who live/work/congregate in it properly warm/cool with enough light/ventilation, and at what cost for the building operators and the environment?

- How can you report performance and consumption?
- Is there any way to find this out dynamically?
- Can you get the proper information about your building's lifecycle perfor-

mance to make effective decisions during design development?

- Can you iterate analysis without having to leave your design environment or interrupt workflow for long periods of time?

The good news is that building analysis software is developing quickly and beginning to provide quite useful data to designers in various formats. You can check building energy performance against recognized benchmarks. You can change siting, materials, systems, and design options against climate conditions for almost any place in the world to derive energy cost figures for construction and building operation.

Weather information records are becoming digitized just like maps. I'm not a building analysis scientist, nor do I have comprehensive knowledge of the standards that are proliferating worldwide. As with most government efforts, energy standards are bringing an alphabet soup of acronyms into play: LEED, ASHRAE, CIBSE, and BREEAM are joining words or semi-words such as Greenstar and Energy Star. All of these are ways of measuring and reporting energy content in building construction and energy usage in operation and comparing them to standards.

What's out there?

What building analysis applications are on the market now, and how do they work with Revit? I took in presentations on Sustainable Design and Revit at Autodesk University in December 2008. These presentations covered LEED credits and Certifications, which US architects and designers will be dealing with for the foreseeable future, and expositions on three external analysis applications that work with Revit.

Integrated Environmental Solutions (www.iesve.com) is the largest independent provider of analysis through its <Virtual Environment> suite of applications. The company has partnered with Autodesk and provides free VE-Ware and low cost <VE> Toolkits plug-in applications for Revit.

In 2008 Autodesk purchased two software companies that provide building

analysis applications, Green Building Studio (GBS) and Ecotect. GBS (www.green-buildingstudio.com) has a Revit plug-in. Ecotect (www.ecotect.com) is a stand-alone design and analysis program that currently accepts Revit models in DXF form. Autodesk engineers are working on a closer tie, probably a Revit plug-in.

What do they do?

I encourage you to check out the websites of these analysis applications. All three companies offer trial periods and free applications.

IES VE-Ware is energy and carbon assessment software benchmarked to the US Architecture 2030 Challenge, a system for keying building energy consumption to percentage reduction targets. <VE> Toolkits add the ability to calculate carbon loads per ASHRAE/CIBSE, LEED Daylighting Credit, and Solar Shading animations.

GBS features include whole building energy analysis, carbon emission reporting, water usage and costs evaluation, photovoltaic potential, Energy Star scoring, daylighting, wind energy potential, natural ventilation potential, and design alternative analysis.

Ecotect provides modeling, visualization, and calculation of shadows, reflections, shading design, solar/acoustic/thermal analysis, ventilation and air flow, lighting design, and resource management.

How do they do it?

All three applications make extensive use of gbXML, or **green building eXtensible Markup Language**, as a way of exporting Revit model information and performing calculations on it. Revit exports gbXML as a standard file operation. The plug-ins I mentioned before essentially give the Revit user a button to create the export and open a window in the appropriate application for generating reports, additional modeling, and visualizations.

It is worth checking out these applications for the visualizations alone. You can

generate SketchUp-style linework, renderings, and animations not only of the model, but also of analysis results such as daylight penetration into rooms, solar radiation exposure, shading, and air-flow.

Standard reporting includes carbon emissions per year, water usage, and electricity consumption, all benchmarked against your targeted standards. Your model can be at any stage before using analysis tools, and the earlier the better. Some tools are happy to work with masses; some will work better with walls and roofs defined. You need to define rooms—rooms are important information containers in all sorts of analysis.

What do they look like?

I thought you'd never ask! In this column we will look at the two applications that give you a way to access their resources from inside Revit, IES, and GBS. We'll look first at IES VE-Ware and the <VE>Toolkit. IES creates both a toolbar and a menu inside Revit, as shown below.

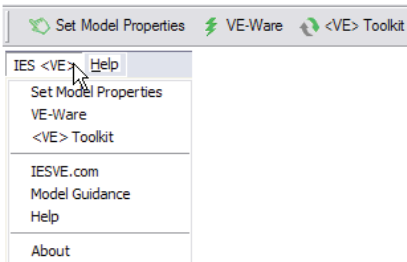


Figure 1: IES menu and toolbar

To use IES, save your model, then click Set Model Properties. Revit will run calculations for a moment or two, then open the Set Model Properties dialog, with two tabs on the right, Building and Rooms, and a view pane of your model on the left. The view pane controls let you zoom, pan, orbit, change display mode, and create animations or walkthroughs. I score this view window 10 out of 10 on the Check-It-Out scale!

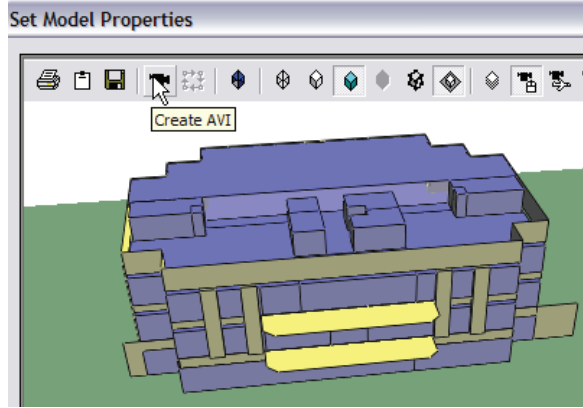


Figure 2: IES model view

On the Building tab you set criteria for your model:

- Building Type, a list of buildings by use (Motion Picture Theater, for example)
- Construction (a separate dialog where you can make Types), where you specify Walls, Slabs, Roofs, Windows, etc.
- Systems, a list of heating/cooling choices.
- Place and Location, a dialog with world-wide choices.



Figure 3: IES model results

The Rooms tab is a list of the defined rooms in your model, which you can display/isolate in the view window, or to which you can apply different Construction or Systems information.

When you have set up your model information, click the Step 1: Check model button in the lower left. This generates a report on your rooms, listing discrepancies.

Step two is a check of your model against 2030

Challenge criteria (US only). You can adjust the 2030 settings. To run the check and see the result, check the box and click OK, then use the VE-Ware tool. The routine runs simulating a year's time span, calculating energy usage and carbon emissions. The results display on a web page (see Figure 3).

Other tools available in the <VE> Toolkit include CIBSE Load Calculation, Daylight Assessment, Solar Shading, and LEED Daylighting Credit analysis.

Green Building Studio

To install the GBS plug-in you need to set up a trial account. The plug-in creates a Green Building Studio Client option on the Tools > External Tools menu.



Figure 4: The Green Building Studio menu pick in Revit

The GBS Client will warn you of problems in your model with roofs, floors, rooms, or location information. At present GBS has only US weather data. You log in to your account to perform a run of your building model. Once completed, your project run produces a page with the following tabs.

- Energy & Carbon Results
- US EPA Energy Star
- Water Usage
- PV Analysis (surfaces suitable for photovoltaic panels with cost-benefit analysis)
- LEED Daylight
- Weather, including summary data from local (US only) stations, charts of daily temperature/sun/rain conditions, and wind roses (daily direction/force variation charts)
- 3D VRML View. You will need to install a VRML plug-in for your browser (links are provided)

Weather Station: GBS_04R20_089081

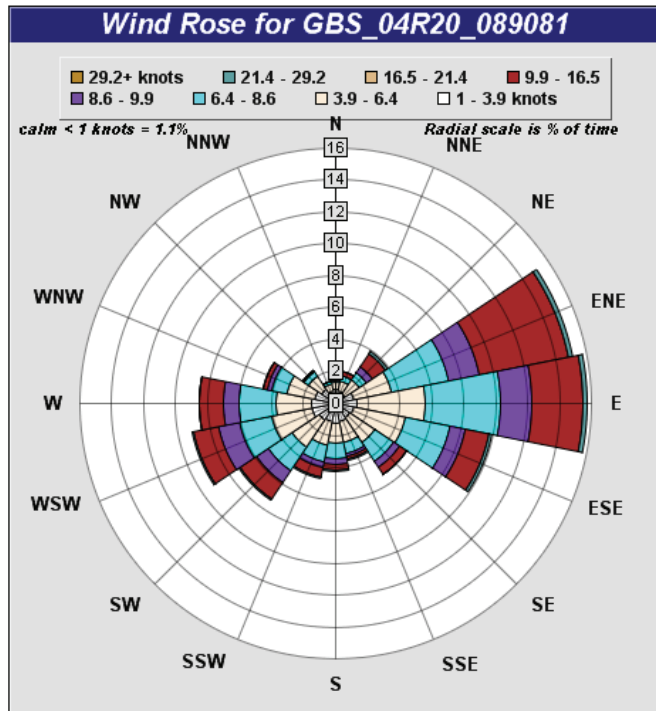


Figure 5: A Wind Rose diagram. Are the windows or vents in your building able to take advantage of cool afternoon summer breezes?

An animated explanation of the Energy and Carbon Results page can be viewed here: <http://download.autodesk.com/us/>

[green building studio/greenbuilding studio carbon results 1024x768.wmv](http://greenbuildingstudio.com/greenbuilding-studio-carbon-results-1024x768.wmv). GBS will process design alternatives and you can download results files.

Go for it!

This article has been a way-too-short introduction to what will be a big change in building design work practice over the coming years. Since all the applications reviewed here have ties to Autodesk and Revit and offer free or trial looks at their products, I encourage everyone with an interest in beating the competition to the next hot market territory (much bigger than a niche) to take a considered look at Sustainable Design with Revit.



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Civil 3D Data Shortcuts: How to save your RAM and your DWG

Alignments, profiles, assemblies, corridors, and more... not only are they dynamically interacting with one another, they're practically drafting themselves, thanks to your awesome arsenal of AutoCAD® Civil 3D® styles.

Sure, you've invested some time in creating this utopian model, but with Civil 3D software's dynamic nature, you see it as time well spent. That is, until the honeymoon ends and Civil 3D quickly becomes the nemesis, refusing to let you into the drawings you've labored for hours creating. Surely you didn't sign up for this, but with that big deadline coming like a freight train, you've got to do something to get into your files.

Seeing that Civil 3D is giving you some error such as "Out of memory," it's sensible

to try opening the drawings on another, more powerful machine. We'll assume all Civil 3D needed was a little more horsepower and that you were able to open the file. But wait... no, seriously, wait... as Civil 3D takes its time to regenerate your model. You may want to brew a pot of coffee while you wait on Civil 3D to process this one!

While throwing more hardware at the project may temporarily fix things, that surely can't be the "solution," can it? The answer: absolutely not! More often than not the underlying issue here is what I call the silent killer of Civil 3D—data architecture. I call it the silent killer because we start with the best intentions only to find ourselves unable to open our DWGs one midsummer's night.

Civil 3D project structure

The Land Desktop Project provided a pretty compelling structure straight out of the box. It was theoretically possible to simply install Land Desktop and jump straight into building surfaces, drawing alignments, and so on.

In doing this, Land Desktop would automatically take care of filing your design elements in the right place (surfaces) and also make them available to all other drawings within the same project.

To put things in contrast, Civil 3D doesn't do any of this for us out of the box. Rather than storing design elements in a series of external databases, Civil 3D stores everything within the DWG file itself. That means it's up to you, the Civil 3D user, to determine which objects to store in which

file and even where the DWG itself should be saved.

While the Land Desktop model of “share everything” proved a convenience at times, it also made keeping your project organized a cumbersome ordeal. Road alignments were mixed in with pipe alignments, old surfaces with new, and so on.

Civil 3D, on the other hand, employs an à la carte approach to data sharing. For instance, unless an alignment was needed in another drawing, I can do nothing and have it privately stored within its host DWG. My EG surface, on the other hand, is probably needed in a large number of DWGs throughout the project. So I’ll share it with the rest of the project with this little thing called data shortcuts.

Introduction to data shortcuts

In essence, data shortcuts bring the functionality of the Land Desktop Project to Civil 3D. While data shortcuts have existed in Civil 3D for some time, they were dramatically overhauled and vastly improved in Civil 3D 2009. Before Civil 3D 2009, creating data shortcuts was a rather manual process. Today the process is much more automated and actually mimics the functionality of Autodesk® Vault (Autodesk’s document management system).

Conceptually, data shortcuts and external references (XREFs) are much the same. When I XREF a DWG, the lines, arcs, polylines, etc. stay in the source drawing and simply display in the host drawing. If I were to detach the XREF, the objects within that drawing are no longer displayed inside my host DWG.

Data shortcuts share a lot of this functionality. Let’s assume I have created a data shortcut between my EG surface, which is contained in V-XPTOPO, and my grading file C-SPGRAD. Although I can see the EG surface in my C-SPGRAD DWG, any modifications must be done from the V-XPTOPO DWG. Thanks to the power of data shortcuts, any modifications made to EG within the V-XPTOPO DWG will also populate the C-SPGRAD file.

Setting up data shortcuts

Data shortcuts contain three elements that make everything come together: the working folder, the data shortcuts directory,

and the shortcuts themselves. For the sake of discussion, the *working folder* the same way as the *project path* in Land Desktop. To that end, the data shortcuts folder is similar to the Land Desktop project directory.

Let’s say I have a project located under C:\Civil 3D Projects\AUGN. Just as my Land Desktop project path would be C:\Civil 3D Projects, my Civil 3D *working folder* will also be C:\Civil 3D Projects.

Data shortcuts can serve as the vehicle to share any number of alignments, pipe networks, profiles, surfaces, and even view frame groups. Of course, before this can be done I must first create a place for my data shortcuts to live. This is done by using the *New Data Shortcuts Folder* command.

This command is incredibly similar to the *create project* command found in Land Desktop. While I don’t have a project prototype in Civil 3D, I do have project templates. The functionality of project templates is a near perfect carbon copy of

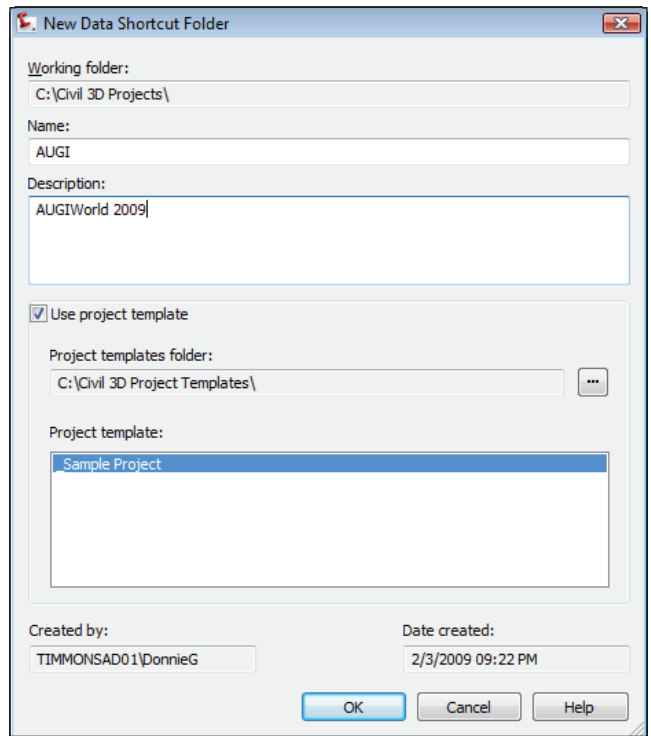


Figure 3: Use the *New Data Shortcut Folder* dialog to create a new Civil 3D project

Civil 3D Project Templates. Creating a new project directory is as simple as right-clicking on the Data Shortcuts node in prospector, and selecting *New Data Shortcuts Directory*. This will open the Create New Data Shortcuts Directory dialog.

Name: This is simply what I want the project directory to be named. I’ll use AUGI for this example.

Description: Although optional, I always recommend entering a logical description for my project. This doesn’t affect the functionality of Civil 3D, but it helps me retain my sanity when locating projects.

Use project template: This box must be checked to create

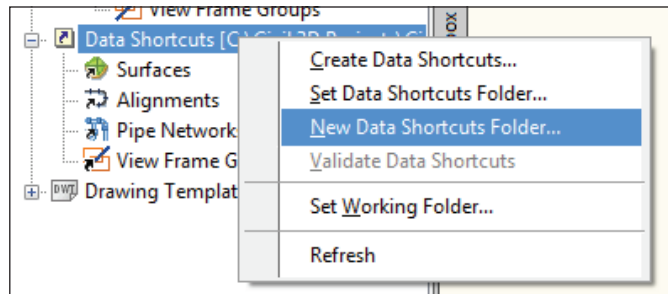


Figure 2: Creating a new project directory in Civil 3D

a new project directory using a standard template. After checking, the lower half of the dialog will be enabled.

Project templates folder: Equivalent to the prototype path in Land Desktop, this is generally a network location where my standard project template(s) live.

Project template: A Civil 3D project template is really nothing more than a prototype. Within it lives a series of empty folders I have configured per my company’s file management standards. For this



Figure 1: Data Shortcut directory structure

example I am using the template that ships with Civil 3D named `__Sample Project`.

Sure, the fact that Civil 3D can create a project directory based on a template makes my life easier, but there's an equally important directory being created in the background. When you create a project using the above method, Civil 3D will

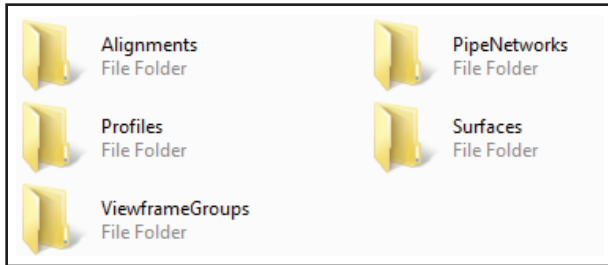


Figure 4: Structure of the `_Shortcuts` directory

create a `_Shortcuts` directory. Within this directory are five subdirectories; Alignments, PipeNetworks, Profiles, Surfaces, and ViewframeGroups. These directories correspond with the Civil 3D objects I can share using data shortcuts.

Creating data shortcuts

With our project directory primed for data shortcuts we're now able to select the objects we want to share with other draw-

surfaces within my grading file, the only surface I really care about outside the grading surface. Thus, it would be senseless to create a data shortcut link to these extra surfaces, as they are only relevant within the grading file itself.

Creating data shortcuts is as simple as right-clicking on the Data Shortcuts node in prospector and selecting `Create Data Shortcut`. Civil 3D will launch the `Create Data Shortcuts` dialog where you can select the objects you wish to share from the list.

In addition, if you'd prefer selecting objects graphically, check out the `Pick in drawing` button located in the lower left corner of the dialog. Either method will yield the same result.

The best way to tell if you have successfully created a data shortcut is to take a look at the drawing prospector. In this case I created a shortcut to

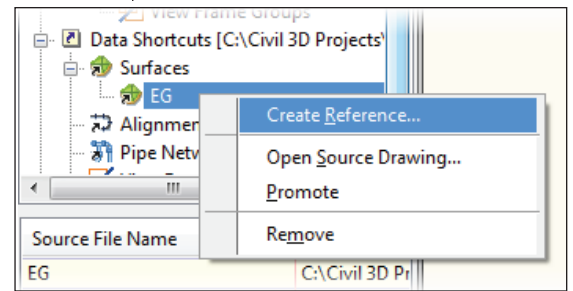


Figure 6: Creating a data shortcut reference from prospector

Inserting data shortcuts

When working with data shortcuts, it is important to note that the "shortcut" is just a pointer. Think of it as the "saved path" in an XREF. The saved path isn't the drawing itself; rather, it's the location where AutoCAD® can find the drawing.

Using data shortcuts does not alter the way Civil 3D manages design data in any way. The data still lives within a DWG somewhere. The shortcut is really nothing more than an XML file containing the location of your surface, alignment, etc. Starting with the 2009 release, Civil 3D creates this XML file for me on the fly and stores it in the correct place.

Before I can insert a data shortcut I must first locate it within the Data Shortcuts node within prospector. For instance, I want to shortcut my EG (existing ground) surface into a new drawing. To do this I'll navigate to `Data Shortcuts > Surfaces > EG`. From there, right-click on the surface name (EG in this case) and select `Create Reference` (see Figure 7).

The final step in creating a data shortcut reference is to tell Civil 3D which style to use for the object being inserted. What's interesting about Civil 3D data shortcuts is the fact I'm referencing the object, not the contours, so to speak.

This becomes a golden nugget when I have a multiple phase project. Perhaps I have a Phase 1 FG surface that needs to be shown as existing in my Phase 2 plan set. Again, thanks to the fact Civil 3D is referencing the actual object, this is absolutely possible. When the Phase 1 surface is updated, its changes will automatically populate to my Phase 2 project. Personally, this functionality is perhaps one of the most compelling elements of data shortcuts.

Obey the Civil 3D REGEN rules

One thing data shortcuts won't do is save you from the REGEN rules of Civil 3D. What are the REGEN rules of Civil 3D? Simply, it is being cognizant of the data I insert into DWGs and, more importantly, the data I reference into them.

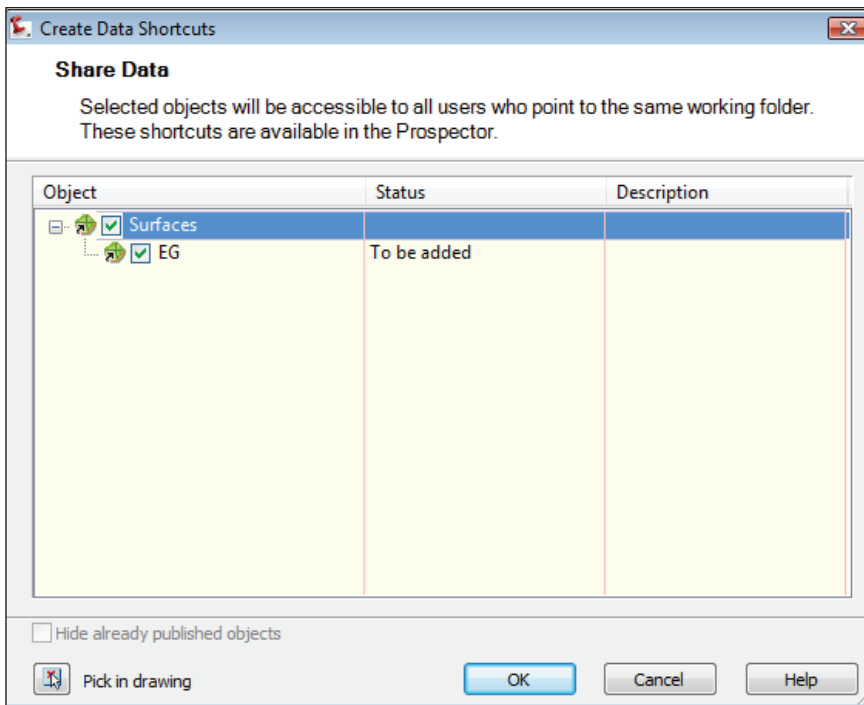


Figure 5: Select the objects you wish to share (shortcut) from the list in the `Create Data Shortcuts` dialog

ings. This à la carte approach allows me to share only the data relevant to other drawings in my project. For instance, while I may have some number of constructor

a surface. To verify the shortcut, I can browse to `Data Shortcuts > Surfaces` from prospector.

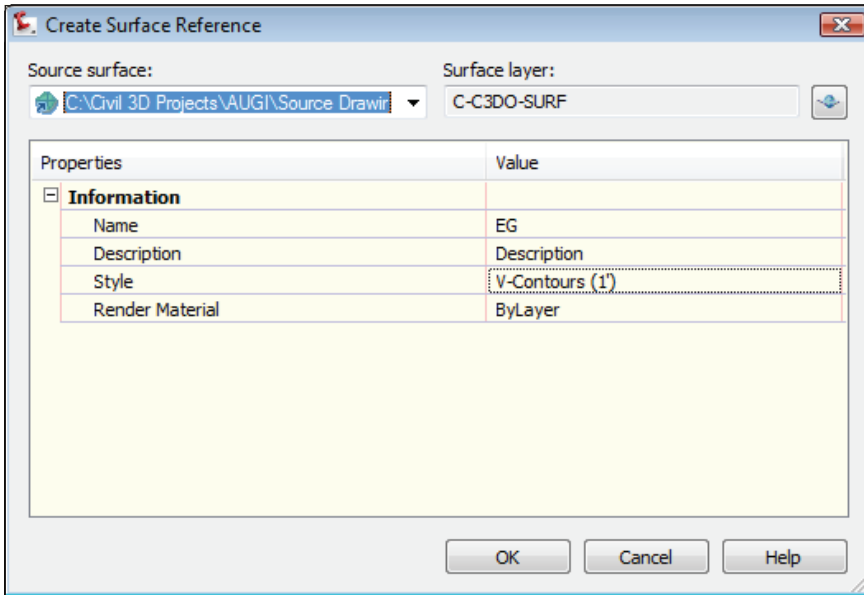


Figure 7: Use Civil 3D styles to style design elements differently in different parts of the project

The reason for this is the way AutoCAD regenerates Civil 3D objects. Civil 3D objects are not cached, and consequently must be called every time AutoCAD executes a REGEN. Ever wonder why that Civil 3D drawing of yours takes forever to open? The answer is simple—REGEN.

When AutoCAD REGENs a Civil 3D DWG, it is performing a separate REGEN operation on every Civil 3D object in every viewport of your DWG. Thus, if you have a DWG with four viewports, you've just waited for every Civil 3D object to be processed four times.

Think of it like this. Say you have a draw-

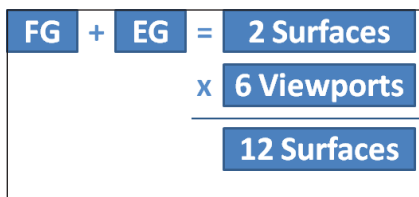


Figure 8: The REGEN rules of Civil 3D

ing with just two surfaces, but that drawing has six viewports. Due to the REGEN rules of Civil 3D, you've just essentially waited for 12 surfaces to REGEN.

Now it is probably understood that this rule applies to surfaces, alignments, corridors, and the like, but actually this rule applies to ALL Civil 3D objects. All Civil 3D objects not only include model objects, but also object styles and label styles contained within both your current drawing and any drawing XREFed into it.

So how does one overcome the REGEN rules of Civil 3D? Well, it isn't the black-and-white answer you might want. The solution is really nothing more

than being cognizant of what you're referencing into your Civil 3D drawings and keeping your references to the bare necessities.

To minimize the effect REGENs have on my firm's Civil 3D drawings, we have employed the use of model files and reference files. Model files are never XREFed into another drawing, but instead are used to build my model elements.

A good example of the way this relationship works is with a typical grading model. For a given site, it isn't out of the question to build a few corridors and corridor surfaces and use feature lines and grading objects to do some finish grading. Each of these elements are absolutely necessary for the creation of the model, but not for illustrating my site on my plan sheets.

With that in mind, I will create a model file to house my corridors, corridor surfaces, and constructor objects. Within that model file I'll have an FG surface that I will share as a data shortcut. I will then shortcut just the FG surface into a reference file. By using data shortcuts to create a second reference drawing, I have dramatically reduced the number of Civil 3D objects being referenced into my sheets, and more importantly reduced my wait time when AutoCAD REGENs.

Again the goal is to reduce the amount of data AutoCAD has to process. Be it data shortcuts or some other method, the fewer objects AutoCAD has to crank through, the faster Civil 3D is going to be. While data shortcuts have the potential to drastically reduce REGEN times, there is a handful of other commands worth considering as well. Civil 3D 2009 introduced at least one noteworthy command to help

While data shortcuts have existed in Civil 3D for some time, they were dramatically overhauled and vastly improved in Civil 3D 2009.

you streamline your surfaces. The Simplify Surface command (*Surfaces > Edit Surface > Simplify Surface*) will do as its name implies—remove unnecessary points from your surfaces. Of course, the fewer points a surface has, the smaller and faster it will be.

It's also worth mentioning that frozen Civil 3D objects do not REGEN. Thus, you can save yourself some time by freezing the object layers for objects you're not using. It has been my experience that no one method does everything. I've gotten the most mileage out of data shortcuts, but that's not to say I haven't also used other things such as the simplify surface command. But start clean, work clean, and you can quickly tame Civil 3D software's somewhat overzealous REGEN habits.



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Autodesk Impression Tips & Tricks

Where to begin?

What is the most difficult part of starting a project? Starting that project. What do I want to do? What do I need to do? How will I do it? What tools should I use? What if I get stuck? What if I need to make a change halfway through? Or worse, what if I need to make a change after I get finished?

Autodesk® Impression asks these same questions. How do I start? Where do I start? What is the best method for starting a design illustration with Impression?

I venture to say that there isn't any one "best" way. Your method for starting a drawing in Impression will depend on several things. What do you and your client want to illustrate? What information does your drawing need to convey? What is your source file? What is the condition of the source file? Is there a possibility that the source file can change? I could go on and on, but I won't because you get the idea.

In this article I want to take a look at starting a plan view drawing of a possible site for a warehouse and the steps we will take to set up our drawing.

First, there is CAD

In our example we will start with a single DWG file provided to us by our client. Our client wants to be able to display one large-format drawing for a meeting and needs to display the overall site plan, an elevation, and a detailed view of the office area.

Sounds busy and difficult, but knowing ahead of time what is needed sets our course of action. We start with the DWG file from AutoCAD.

Unfortunately, the source file does not help our cause. It is full of exploded hatch patterns and blocks. There are no closed

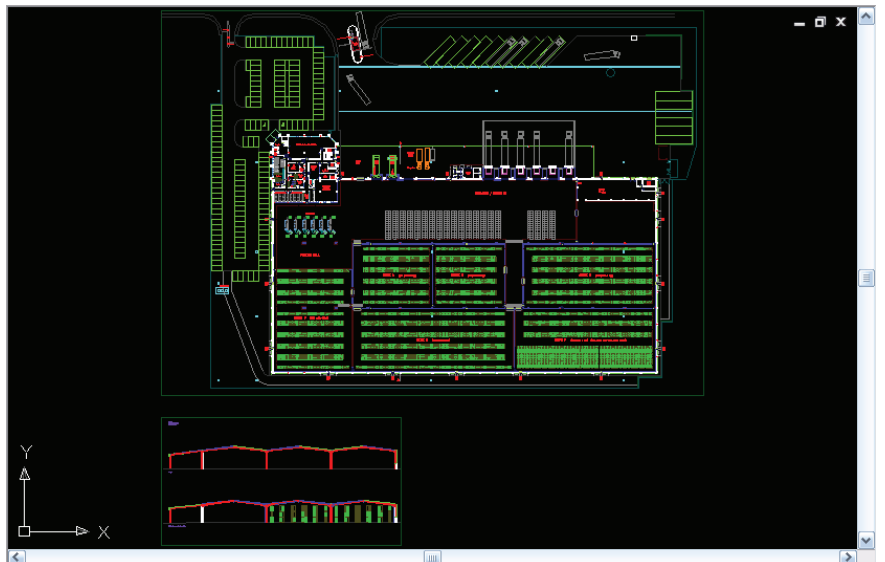


Figure 1: The CAD file with which we'll begin

polygons to speak of. That means we have to make a choice between doing prep work in AutoCAD so that we can easily apply styles to layers when we import it into Impression, or we can use fill styles.

Typically, fill styles can be applied more quickly than prepping the AutoCAD file, especially one that is this complicated. It will take a lot of work to clean up this particular file. However, since we need to create a more detailed view of the office, it may be prudent to close some of the linework in that area only. It's a decision you would have to make on a project-by-project basis.

In this case we could spend a lot of time fixing the DWG file only to receive an updated version from the client that will also

directly into Impression and look the way we want it to.

There is another choice to make before setting up the layout tab. Do you want to make one layout and import it, or import each viewport individually? Typically, I would import the entire layout in one step, but sometimes the drawings may be more complex and Impression might have a hard time importing them all at once. Use the method that works best and is the most efficient.

Import from a view

You have a choice to make, again, when importing your drawing into Impression.

There are three choices; Layout, Viewport, and Model space. Clicking the model

space tab inserts the linework in the model tab. Seems obvious, I know. The Layout imports the layout tab of your choice. A list of all available layouts in the file will be listed.

The same goes for the Viewport selection. All viewports will be available. Viewports aren't named, so Impression numbers them. The first viewport will be the one that was created first, then the second, the third, and so on. If you didn't make the viewports, or forgot in which order they were created, there may be some guesswork involved.

If you choose to import the model space tab, you will get to pick the canvas size and orientation. There are standard canvas sizes from which to choose: Letter, Legal, ANSI, ARCH, ISO, and a size to customize.

Initial setup on import

When importing a file, there are several settings from which to choose. Some will help performance while others will automatically set up a stroke style for the imported linework. These are important because they will help you start off on the right foot.

Some of them can be changed later on in your work, but you could save a lot of time with little effort on your part. In some cases, though rare, you may even finish your drawing by starting it.

Style assignments

In the first tab (What to Open) on the import window, we discussed how it handles what you are importing. The next tab, Style Assignments, does exactly what the tab name implies. This is where you assign a style to what you are importing. There are only two styles in this tab to import,

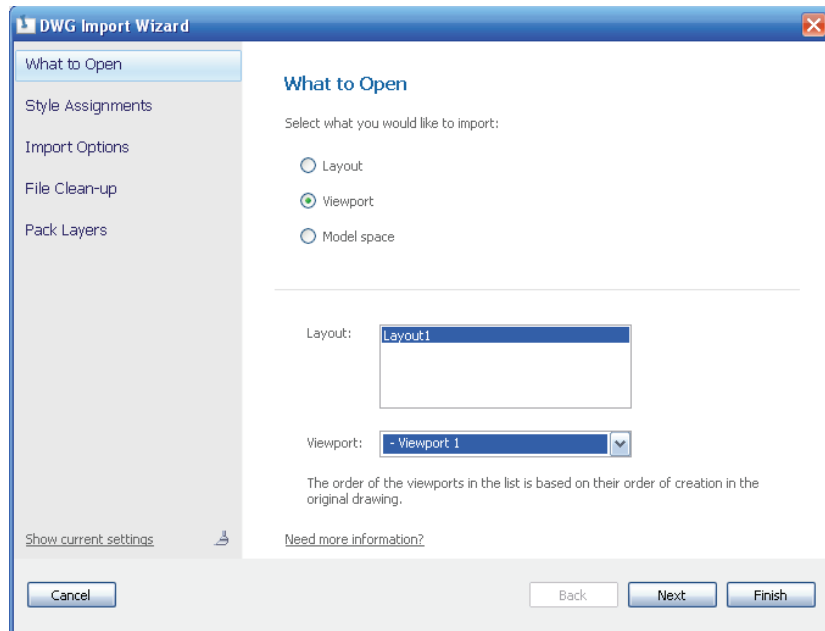


Figure 2: The interface window when importing a drawing into Impression

need "fixing." We would have wasted all of that time.

In this case, we will limit the work spent on reworking the CAD file, just in case. Besides, Impression 2 uses anchor points for fills, so as long as there aren't crazy changes to an updated DWG file we will generally be okay. Again, weigh the needs of the project to make this type of decision.

We start Impression and make a new file that is an Arch D size. Now we want to import the file so we can begin rendering it. We need three views: an overall site plan, an elevation, and a detailed plan view of the office area.

The CAD file we were given has the linework we need in the model tab. In this case, we are going to create a layout tab with three viewports arranged the way we want the views to be displayed. The reason for this is that we can import this tab

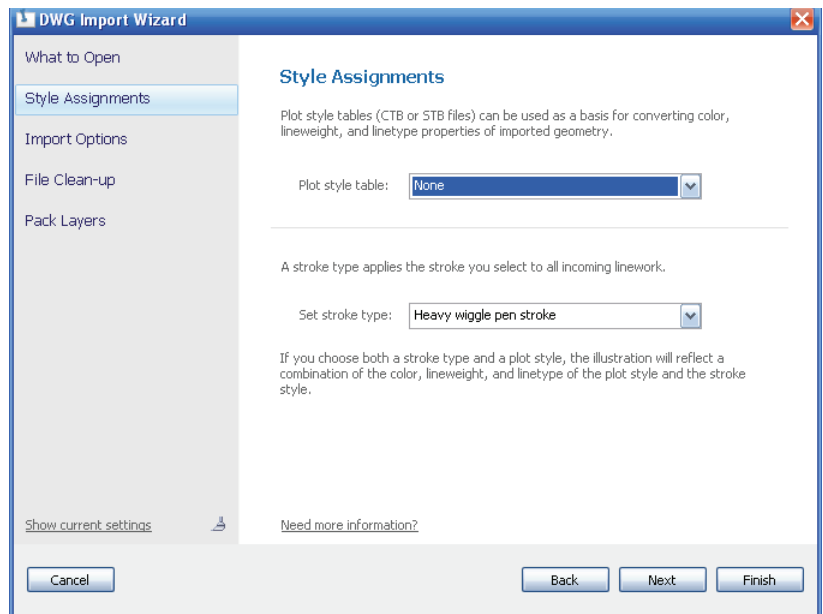


Figure 3: The Style Assignment Tab controls the way your linework is imported

Make sure to take advantage of the import settings available to you in order to make your drawing work easier and in a more standard fashion.

the plot style settings and the general pen stroke setting.

The Plot Style tab will import your linework according to the plot style of your choice. In this example, if the client had sent a CTB file, then we could import the drawing into Impression using the client's pen weights, colors, thickness, and so on. This is very handy in that it will make the linework look exactly the way the client created the AutoCAD file to look. Keep this in mind when requesting files from clients to import into Impression.

If you did not get a CTB file, then you can choose the NONE option, which will import the linework with a standard line thickness and color. All of the lines will look the same when imported.

save you the time of having to apply a pen stroke to every layer later on.

It's amazing how much time this will save you. Now all you need to do is add fill styles to the appropriate layers or you can still create new layers in the drawing. If you change your mind about the pen stroke type after you have started the drawing, just make the changes in the layer manager.

Import options

Not surprisingly, the Import Options tab has more options. There are several settings that you might never change. You can set the import units setting (inches, feet, millimeters, etc.), the style map you want to use, 3D settings, and mapping options.

finished! The 3D settings will determine how Impression handles 3D linework. The mapping settings will import substitution blocks if necessary.

File clean up

This tab will help you process the import file more cleanly. You can choose not to import or automatically set up layers that are turned off, frozen, or set to not plot in the AutoCAD file you imported. What sense would it make to create layers that aren't being used? This tab will also allow you to choose not to import images, dimensions, leaders, hatches, or text from the AutoCAD file if you don't want to. Sometimes, you might want to create these types of objects directly in Impression.

Pack layers

This last tab is there to help performance. If you have the layers packed, it will treat all of the objects on a layer as a single object. It makes it easier to apply styles and to edit the drawing.

It is recommended that you do this. If you want the layers to unpack, just click the unpack layers icon in the layer manager. It will happen instantly.

Conclusion

Impression can do a lot of work for you before you barely start your drawing. The approach you need to take when starting a drawing depends on what you want to achieve and what you have to work with. Make sure to take advantage of the import settings available to you in order to make your drawing work easier and in a more standard fashion.

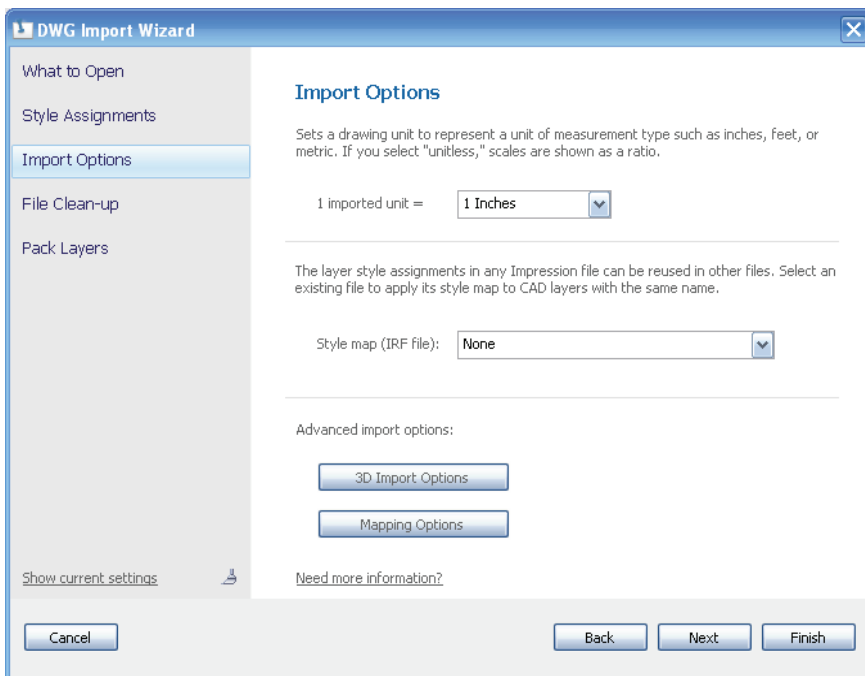


Figure 4: The Import Options tab allows you to control units and standard styles

The Pen Stroke Type will apply a standard pen stroke to the imported linework. A layer will be created in Impression that matches the layers from the imported AutoCAD file.

The pen stroke style that you choose here will be applied to each layer. This will give your drawing a uniform look and will

The units setting is simply a pull-down menu where you choose the unit of measurement you will use. The style map can apply preprogrammed styles to your layers. These styles will apply fills, strokes, etc. to the layers you import. In theory, if you are using the proper style, once you import the linework, your drawing could be

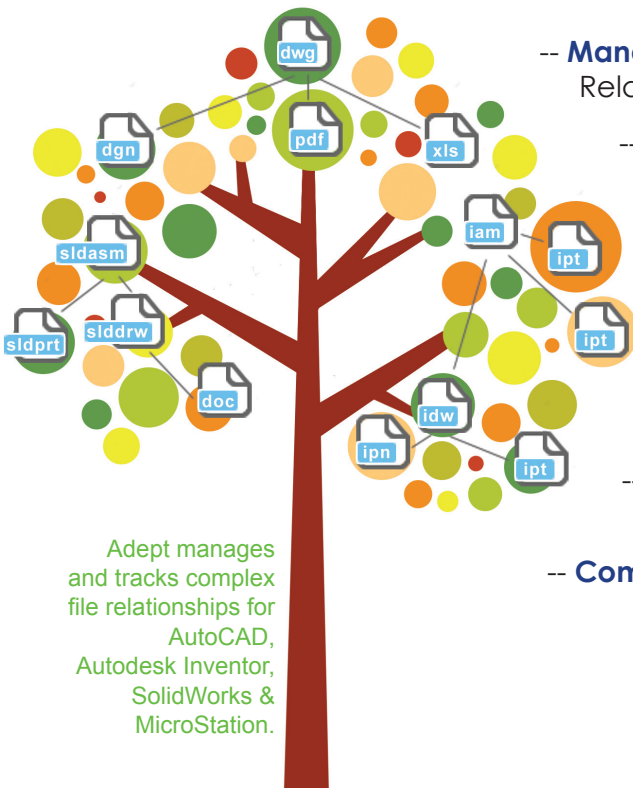


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Redefine your Collaboration Workflow



By now I am guessing that most of you are already using Revit® Structure to produce your design documentation, and, if you aren't using it, more than likely you are at least considering it. If you aren't looking at it, what are you waiting for?

The use of Revit for any discipline definitely changes the workflow for you. If the workflow is not changing, then you were doing it way different than the way I was doing it! How different this workflow becomes depends a little bit on how much you are willing to change how you have been doing things in the past with other 2D CAD applications. Let's take a second and reminisce about what I now call the "Old School" 2D days of CAD.

Old school CAD

As structural professionals, we would always receive what everybody said was this perfectly good CAD file from the architect. This file contained everything we needed to produce our structural documentation, we were told. The thinking went something like this: "They already have the grids laid out. Let's just trace over them, or better yet, let's just copy/paste them into our file, or much better yet, let's just save their file as a new file, delete information that is not

needed, and make it our structural file."

In return, the CAD manager would say, "ABSOLUTELY NOT! We are going to verify every single line, dimension, text, and draw our own information in our file." Why was this done? Because over time we began to lose faith in the accuracy of the drawings we were receiving. Structurally, we wanted precision set to 1/256" and "they" wanted it set to 1/16" or sometimes even 1/8".

Other programs were used to produce napkin sketches of the building during schematic design and those sketches were being pulled into CAD. Sometimes the sketches were turned into nice numbers that were easy to work with and other times it looked like they were just left as sketches.

The bottom line is we could not trust the CAD files to enable us to produce an accurate set of drawings that would allow other parties, such as fabricators, to use downstream. Using Revit on a project changes all of that; at least it needs to in order for the whole process to work.

The workflow needs to change

What needs to change? First, everybody needs to start producing accurate models

that we all can trust. This means that those working on the project are going to have to step up their game a bit and go that extra mile to make things correct. Without this accuracy in the Revit models you are sharing, you will have little chance of relying on someone else's model.

Second, we need to start communicating again. No more of the architect moving an elevator shaft over 6" so he or she can maintain a certain corridor width and not tell structural it was done. Drawings get issued, it gets built from the structural drawings, and the elevator shaft is constructed in the wrong location. There can be no more of the engineer changing a beam depth size and not telling mechanical. The field guy is installing some duct work and finds out that his duct work does not clear the bottom of the beam. Dropping it would lower the ceiling height. Who wins?

I could go on and on with scenarios from all sides of the design team, but right now I would like to talk about how Revit can eliminate this. Using Revit to model your projects and to produce construction documents is a chance to regroup with everyone and change the way you have been doing things in the past. I know that some of you who have been doing this correctly,

but I also know that there are others using the undesirable methods described above. So let's discuss the workflow that can get you started in a new direction.

Using a dependent collaboration workflow

What do I mean by dependent collaboration? Well, this means that each discipline models only the elements for which it is responsible. Architectural should not be modeling footings, foundation walls, columns, framing, and structural slabs. Structural shouldn't be modeling exterior finishes and door/windows to show how they relate to a lintel or a foundation wall. And I have to believe that Mechanical does not want to model any of that, preferring to model its own discipline-specific elements.

Can all of this happen 100 percent of the time for every project? No. You will face challenges that might discourage you from thinking that any of this makes sense, but hopefully as you are reading this, you are thinking about what part of this workflow might allow you to take advantage of the same benefits we see when we work on projects in this manner.

Some project schedules might not allow for this workflow and certain structural systems may accommodate this more easily than others. There will always be scenarios that will prevent some of these efforts from being carried out to the fullest degree. But over time, I see this slowly decreasing as

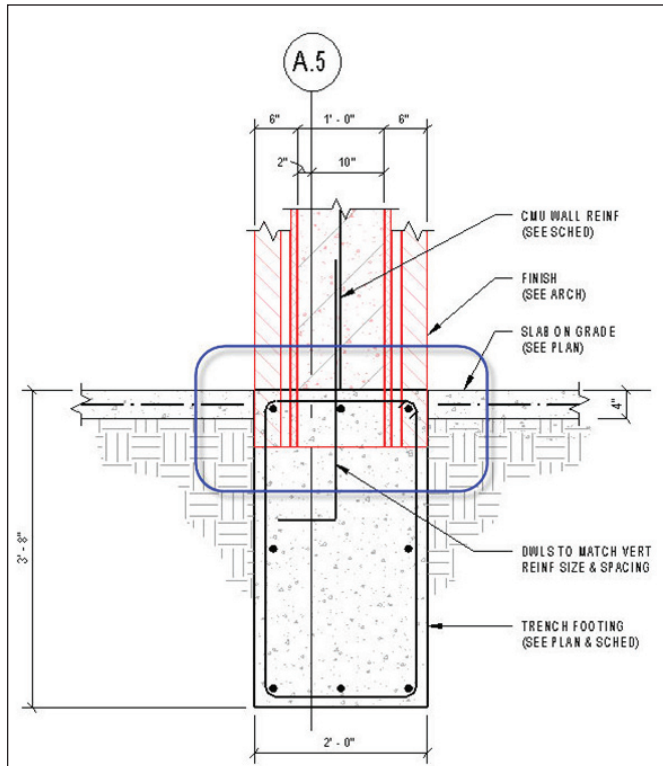


Figure 1

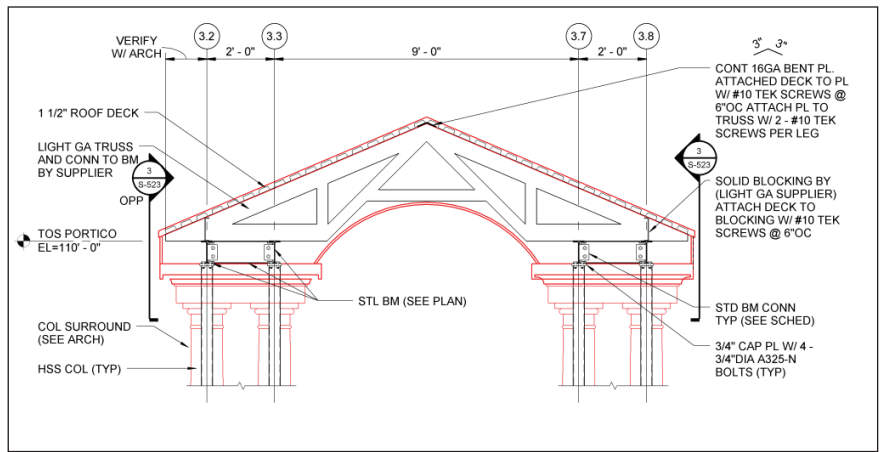


Figure 2

the workflow is further defined.

At my company, this method of collaboration is what we try to use on the majority of our projects. The goal for all team members is to avoid modeling anything twice. If this can be done, then your model has to be coordinated or your drawings will not be correct. Figure 1 shows a structural section that clearly is not coordinated.

The red indicates that the architectural model is linked into the structural file. This information is not modeled by structural; structural can't change it because it is linked into our model. We could lower the trench footing down, but whose model is right? Well, I'm going to say that structural's model is right because structural is always right! Of course, the architects will say they are always right.

Seriously, we could both change our models to be correct, but the next time we exchange our models the section would be wrong again. In the past, we would each change our drawings and when the drawings were issued we would not be coordinated. With Revit, you can be dependent on each other's work, so as long as you are communicating about whose model is correct and you are using the most up-to-date models prior to printing, you will be coordinated. At least if your section is wrong, it will be

Using Revit to model your projects and to produce construction documents is a chance to regroup with everyone and change the way you have been doing things in the past.

wrong in the same way throughout everyone's documents.

What does the structural engineer use from the architectural model?

- Doors
- Windows
- Walls
- Curtain Panels
- Curtain Systems
- Curtain Wall Mullions
- Architectural Columns
- Stairs and Railings

What does the architect use from the structural model?

- Footings (wall, isolated, slab)
- Foundation Walls
- Piers
- Columns/Post/Hangers
- Framing
- Slab on Grades
- Structural Slabs
- Roof Deck

Now don't get the idea that Revit is going to do all of this for you. It will, for the most part, after you determine your settings, but first you need to get yourself familiar with working with the Visibility/Graphic Override dialog box and the RVT Link Display Settings shown below. Getting deep into this is another topic for discussion. So for now, if you are unfamiliar with it, check it out.

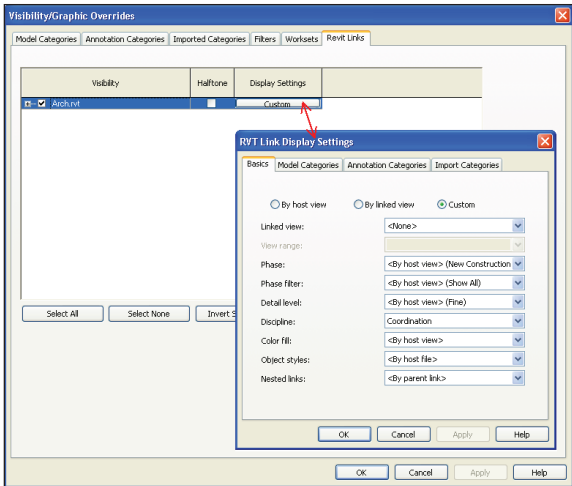


Figure 3

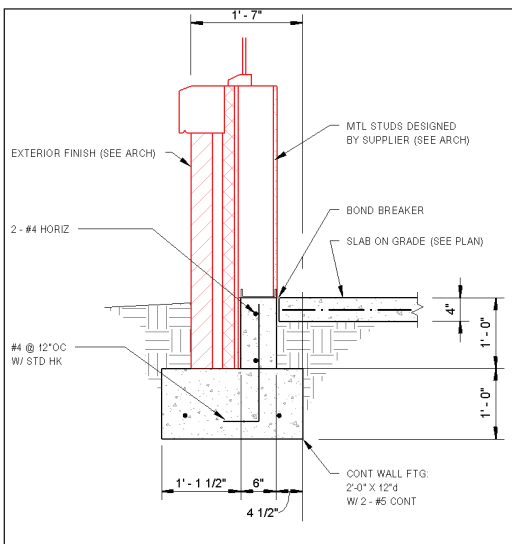


Figure 4

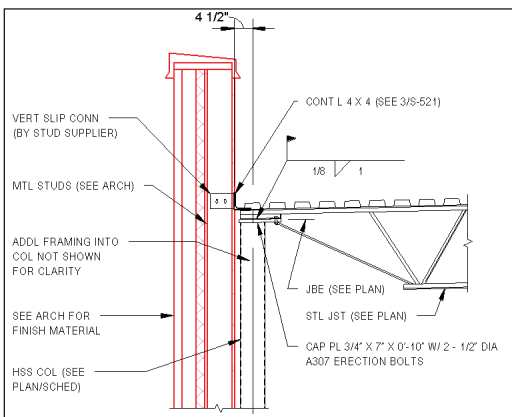


Figure 5

Also take note that getting started with all of this is going to take a bit more time than you are accustomed to, mostly because it is new method of working and thinking and you need to get past the learning curve. What I see is the time you may have spent on the phone after your documents were issued is now shifted to more time on the phone *before* you issue.

The kick is that your time on the phone is going to be much more enjoyable and beneficial for everyone because you are fixing problems before they are costing everybody more money. If you are just starting out, it will take more time because everyone is learning the new workflow as well as trying to understand and learn what everyone expects to happen on the project. So with that said, the most important thing for you to take from all of this is to communicate before a project is even started. Get everybody's expectations out on the table and come up with a plan to achieve your goals.

Communicate, communicate, and communicate some more

During this communication process you need to be communicating internally to your own people, externally to other team members, and continue to communicate on a daily basis throughout the duration of the project. Currently, I find that users of all levels from all disciplines are still learning the software as well as the new workflows involved, so the level of communication required to pull this off is key. The biggest thing is to get everybody on the same page prior to starting a project. Decide what is expected and discuss the best way to work within those expectations.

To do this, we push to have a Revit kickoff meeting prior to any new project. This means that the minute someone catches wind of a project starting up, someone needs to be picking up the phone to get a meeting scheduled. In this meeting we bring with us an agenda that walks the team through everything that should be discussed prior to starting the project.

What things should you talk about in a Revit kickoff meeting?

- Identify team members and their roles
- Set the expectations and goals for the project

- Identify the workflow process each team will use
- Determine who will be modeling what
- Review how each team will be using Revit
- Discuss limitations each team might have with the software
- Discuss how models will be transferred and how often
- Decide when Revit will be used (some might still use 2D CAD for SD and DD)
- Define the deliverables (Revit model, DWF, DWG, hardcopy, model presentation)

You might also consider creating a separate document that is more specific to your company regarding your own list of expectations in terms of what will be in your model as well as what will be in someone else's model.

Be prepared to manage expectations that are not met. You may be dealing with someone who is new to Revit or a client with whom you haven't worked before. Either way you need to be ready to deal with the consequences of a changed workflow and you must relay that workflow back to your own team. At least with the BIM/Revit kickoff meeting, you are dealing with these problems up front rather than waiting until the day of a deadline or after an issue arises.

The use of Revit gives you the perfect excuse to embrace change and redefine your collaboration workflow. Revisit the accuracy of your drawings, duplication of effort, and how you communicate. Over time I think you will find that it was the right thing to do.

So what are you waiting for? Go ahead, call your client or your consultant. Set up a meeting to see how you can use Revit to collaborate on your projects and maybe even change things up a bit with regard to how you work on a project. Who knows, with your next project, you might just be able to leave work on time!



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years of experience with Autodesk products, Jamie has been instrumental in the rollout of several versions of AutoCAD as well as the implementation of Revit Structure. He has been an avid speaker on Revit Structure at Autodesk University and recently co-authored the book Mastering Revit Structure 2009. He can be reached at jrichardson@ericksenroed.com.



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Using Annotation Scaling with AutoLISP

AutoCAD® has always been one of the most powerful software applications in the CAD industry, but AutoCAD has always struggled with annotation. Text and dimension styles are, to be blunt, one of the most frustrating areas inside AutoCAD. These styles can take hours of tweaking, calculations, and check prints in order to get the desired results. When managing multiple scales, text and dimension styles can add up fast, making them frustrating to use, let alone to manage (Style1, Style12, Style48, Style 96 and so on).

Autodesk helped eliminate these troublesome styles in AutoCAD 2008 with a feature known as annotation scaling. Annotation scaling takes all of the guesswork out of working with multiple scales by simplifying things with annotative styles and a drop-down list of scales.

Annotation scaling allows you to change scales quickly and, in turn, automatically adjust text and dimensions on the fly. All this can be controlled by one primary text and dimension style. When creating an annotative text style, you use the Text Style dialog box (STYLE command) and then check the Annotative check box under the Size section. When Annotative is checked, a new Paper Text Height option is displayed. I use a value of 3/32" for my 1/4" = 1'-0" scale drawings, but you will want to use the text height that you want when your drawing is plotted.

Once you create your annotative text style, it's time to create your annotative dimension style. Go through all the options of the New Dimension Style dialog box (DIMSTYLE command) to create your dimension style, but don't forget to check the Annotative check box on the Fit tab when you initially create the new style.

After you spent the time in setting up the new styles, how might you implement them in an office-wide environment? Do you know the drawbacks of using annotation scaling and how it can affect some of your existing customization and AutoLISP programs? Or maybe you are wondering how you can work more efficiently with annotation scaling. In this article, I dive into some of the drawbacks and how to use some basic AutoLISP functions to expedite your workflow with using the CANNOSCALE variable.

Tip: If you don't know what your text style's paper text height is, open a drawing that contains a layout with a floating viewport with your existing text style visible. Use the CHSPACE command to extract a piece of text from model space and transfer it to paper space. Then use the LIST or PROPERTIES command to identify the paper space text height of the text you moved to paper space.

Set the scene, take 1

When you begin to use annotation scaling, the first thing you need to do is make sure your environment is set up. Annotation scaling is a very powerful feature, but if it is used incorrectly it can cause severe problems, so setting up your environment is critical. There are a couple ways to accomplish this, but the easiest method is to open your *acaddoc.lsp* file. (If you don't have one of these files you can create one using a text editor such as Notepad and save it in one of your AutoCAD sup-

port paths. I recommend placing it in the Support folder.)

Tip: You can use the FINDFILE function to locate a file in the Support Search Paths of AutoCAD. (findfile "acad.unt") locates the *acad.unt* file, which is always in the user's Support folder under Documents and Settings. You can use the FINDFILE function to see if you have an *acaddoc.lsp* file already in with the support search paths of AutoCAD.

Inside the *acaddoc.lsp* file, you will want to add the following lines of code. For more information on these system variables, see the AutoCAD Help function.

```
;(New to AutoCAD 2008 MSLTSCALE)
;Changes the Model Space Linetype scale to a value of 1.
(setvar "MSLTSCALE" 1)
;Changes the Paper Space Linetype scale to a value of 1.
(setvar "PSLTSCALE" 1)
;Changes the Linetype scale to a value of 1.
(setvar "Ltscale" 1)
;Changes the Dimension Scale to a value of 0.
(setvar "Dimscale" 0)
```

These system variables are critical if you want your linetypes to show correctly in model and paper space. These values will vary based on how you prefer to see your linetypes, but these values should be a good starting point. Annotation scaling is used not only for text and dimensions, but can also be used to control the scale of an inserted block, hatch pattern scales, and linetype scales. Linetype scales in previous releases had to be adjusted each time a scale factor was changed using LTSCALE system variable. For example, linetypes such as Hidden contain dashes and gaps, which are displayed differently based on the current linetype scale of a drawing.

The only thing you need to do now is issue the REGEN command to update the display of the drawing on screen when the current scale is changed. Annotative text and styles are designated with a special symbol on the ribbon near the name of the style. The image of a commonly used tool in the industry known as an Architect Scale is shown in Figure 1.

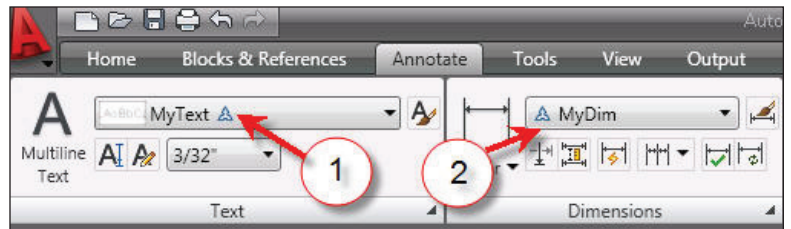


Figure 1: The Text and Dimension ribbon panels: (1) Annotative text style (2) Annotative dimension style

Tipping the scale in your favor

Once you've set these variables in your drawings, you're ready to get started with changing the way you work with annotation scaling. In the previous code you probably noticed that I asked

you set the DIMSCALE system variable to a value of 0 and you may have asked yourself, "What is he thinking?" Just wait; there is a logical reason for my madness. When using an annotative dimension style, the DIMSCALE system variable defaults to a scale of zero. Give it a try—it actually does allow a value of zero—but what is odd is that it asks you for a value when nothing except zero works. When using the Scale List control on the status bar to change the current annotation scale, your drawing will adapt to the selected scale factor automatically for you.

If you use non-continuous linetypes in your drawing, you might set LTSCALE to a value of 48 for a drawing that will be plotted at a scale of 1/4"=1'-0". No doubt you do, but annotation scaling will take care of that as well, making it an instant hit with you and your fellow AutoCAD users in the office.

The annotation scale toggle on the status bar (see Figure 2) can be used to quickly change annotation scales. After an annotation scale is changed, you use REGEN to update the display of the drawing. Now don't get too ahead of yourself, because I am sure setting DIMSCALE to zero is still on your mind as to what this means for your custom routines.

Programs that use DIMSCALE to insert blocks, change linetype scales, run functions, and perform other tasks will no longer work if you start using annotation scaling. Don't worry, for there is a solution to this problem as well. With a little bit of tweaking to your routines, you can adapt them to utilize the new CANNOSCALE system variable. One thing you will need to be aware of is that CANNOSCALE holds a string value and not a numeric value as DIMSCALE does.

In the following example, I demonstrate how to convert the CANNOSCALE system variable and manipulate it to return the desired value. The code can be expanded for additional annotation scales as required by following the outline of the code. To use the code, place it in the file *acaddoc.lsp* in your support search paths for AutoCAD or another routine in which you might want to use it. Once the code is added and the AutoLISP file is located, you simply use (dimscale2annoscale) in your AutoLISP file to ob-

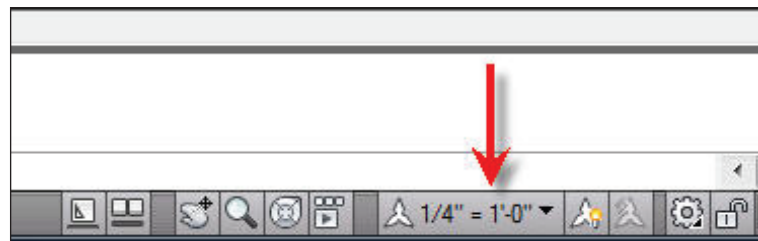


Figure 2: The Scale List control on the status bar

tain a numeric value based the current annotation scale.

;This function converts the CANNOSCALE string value ;to a real value and if no match is found 1.0 is returned

```
(defun dimscale2annoscale (/ cur-cascale)
  (setq cur-cascale (getvar "cannoscale"))
  (cond
    ((if (= cur-cascale "1'-0\"") = 1'-0\"") 1.0))
    ((if (= cur-cascale "3\"") = 1'-0\"") 4.0))
    ((if (= cur-cascale "1-1/2\"") = 1'-0\"") 8.0))
    ((if (= cur-cascale "1\"") = 1'-0\"") 12.0))
    ((if (= cur-cascale "3/4\"") = 1'-0\"") 16.0))
    ((if (= cur-cascale "1/2\"") = 1'-0\"") 24.0))
    ((if (= cur-cascale "3/8\"") = 1'-0\"") 32.0))
    ((if (= cur-cascale "1/4\"") = 1'-0\"") 48.0))
    (1.0)
  )
)
```

Putting your code to work

In the example code below, I demonstrate how to incorporate the (Dimscale2AnnoScale) function into an AutoLISP program.

The function is pretty easy to use in existing programs by commenting out the common (getvar "dimscale") code and replacing it with the (dimscale2annoscale) code snippet.

```
;Program scales a block to match the current annotation
;scale factor, typically used for annotation symbols like
;callouts or sheet titles in model space
(defun c:SI (/ blockname)
  (command "cmdecho" 1)
  (setq blockname
    (getstring
      (strcat "\nBlock to Insert <"
        (getvar "insname") ">: ")
    )
  )
  (if (= blockname nil)
    (setq blockname (getvar "insname"))
  )
  (command "-insert" blockname "s"
    (dimscale2annoscale) pause pause)
  (princ)
)
```

Not just annotation

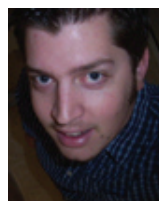
Another powerful aspect of annotation scaling is the ability to control how blocks are inserted into a drawing. In the previous example, I demonstrated how to insert a block and scale it up to match the annotation scale of the drawing. AutoCAD 2008 also introduced a new system variable known as ANNOTATIVEDWG, which controls whether or not your entire drawing is considered annotative. If you have existing callouts, sheet labels, or other symbols that you want to have automatically match your drawings scale and they are saved as separate drawing files, you just need to set ANNOTATIVEDWG to 1 in each of the drawing files. Once that is set in each block, you can then insert them into your drawing and have them automatically scaled appropriately during insertion.

Conclusion

When utilizing annotation scaling that was introduced in AutoCAD 2008, you will quickly realize that working with multiple scale factors is not so bad anymore. In fact, it is actually quite fun on many scales (sorry for the bad play on words).

Things to consider when moving forward with annotation scaling is that existing drawings still use DIMSCALE and so will any of the text and dimension styles in those drawings. Also, don't forget to update your existing AutoLISP programs that depend on the DIMSCALE system variable.

If these situations exist in your office, you'll probably need to develop a hybrid solution that can convert existing text and dimension styles to annotative styles. Make sure you thoroughly examine all existing office programs and make sure that consultants working in previous releases of AutoCAD understand how earlier versions of AutoCAD read annotative data. For additional information on saving annotative objects to a previous release, see the AutoCAD help system.



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Introduction to Materials in AutoCAD Architecture 2009

AutoCAD® Architecture has everything you need for fabulous, presentation-quality renderings! Before being able to create these photorealistic renderings, much needs to be understood about working with Materials, including creating, modifying, and applying materials to objects.

A material in AutoCAD Architecture corresponds to a specific finish material in a building model, such as concrete, glass, or brick. Materials are useful for illustrating plans, sections, elevations, and renderings in the design process. Materials also provide a way to manage the display properties of object styles.

You can take advantage of visual styles, rendering materials, lights, and cameras in AutoCAD

Architecture. In Content Browser, a Visualization catalog lets you access a number of predefined tools for lights, rendering materials, cameras and visual styles (see Figure 1).

Materials also provide the ability to assign surface hatches to objects. Surface hatches can be displayed in model, elevation, and section views. This is helpful to clearly illustrate sections and elevations.

Now that we have looked at the purpose of materials, let's discuss a general overview of how materials are applied, created, and modified.

Materials tool palette

The Materials tool palette in the Tool Palettes

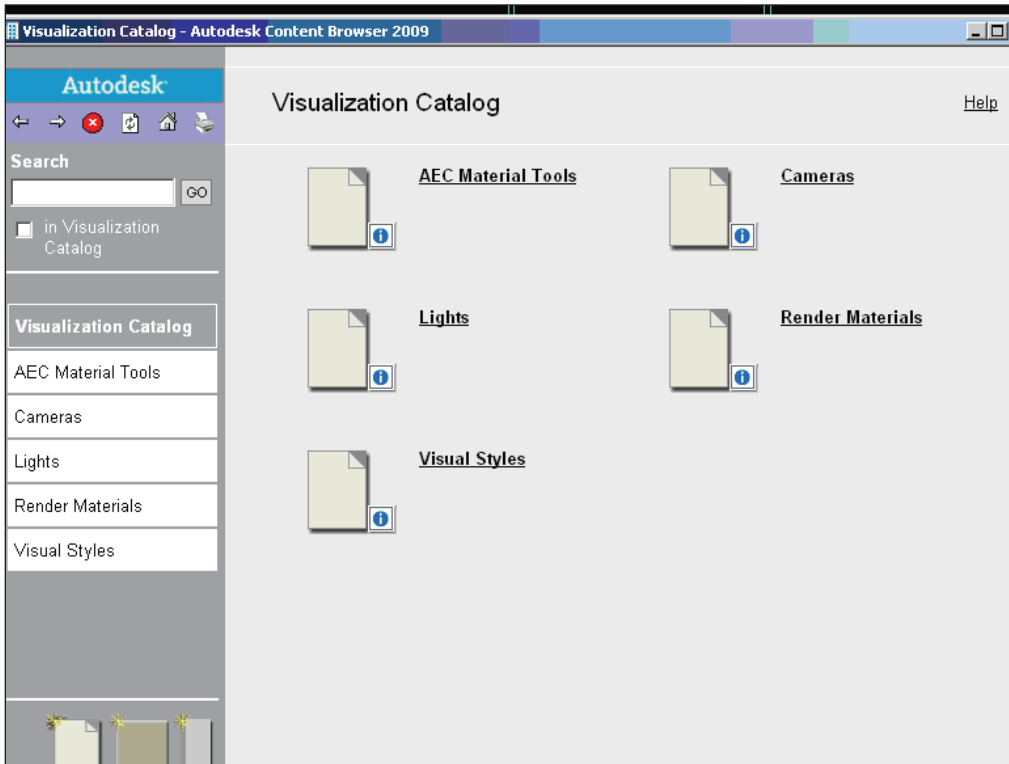


Figure 1: Content Browser

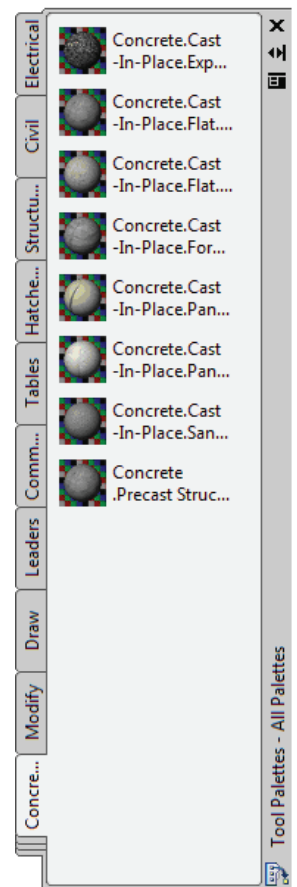


Figure 2: Materials tool palette

window (Figure 2) contains a large number of materials that have already been created and are ready to use. This includes a library containing more than 400 materials!

Materials can be added to objects in your drawings, providing realistic effects. A material's settings are created by its physical properties. Materials can be created and modified in the Materials window, which will be discussed in the section Modifying Materials in this article.

The materials in the Materials Library are typically assigned to 3D objects. AutoCAD Architecture objects to which you can assign materials are curtain walls, walls, doors, windows, railings, roof, stairs, spaces, slabs, mass elements, mass groups, and structural members.

It is important to note that, as you find materials that you use more often, they can be placed on a custom tool palette for easier access. Click the Tool Palettes window title bar and click New Palette to create and name a new palette. The palette is customizable and you can add material tools by copying and pasting from other material palettes. The controls for doing so are on the Tool Palettes window shortcut menu.

Applying materials

A material can be applied to individual objects and faces or to objects on a layer. To apply material to an object, drag the material from the tool palette onto the object. The material is added to the drawing and it is also displayed as a swatch in the Materials window.

When creating or modifying a material in the materials window, you can drag the material swatch directly onto objects in the drawing, drag the material swatch onto the active tool palette to create a material tool, assign a material to an object by clicking the Apply Materials to Object button

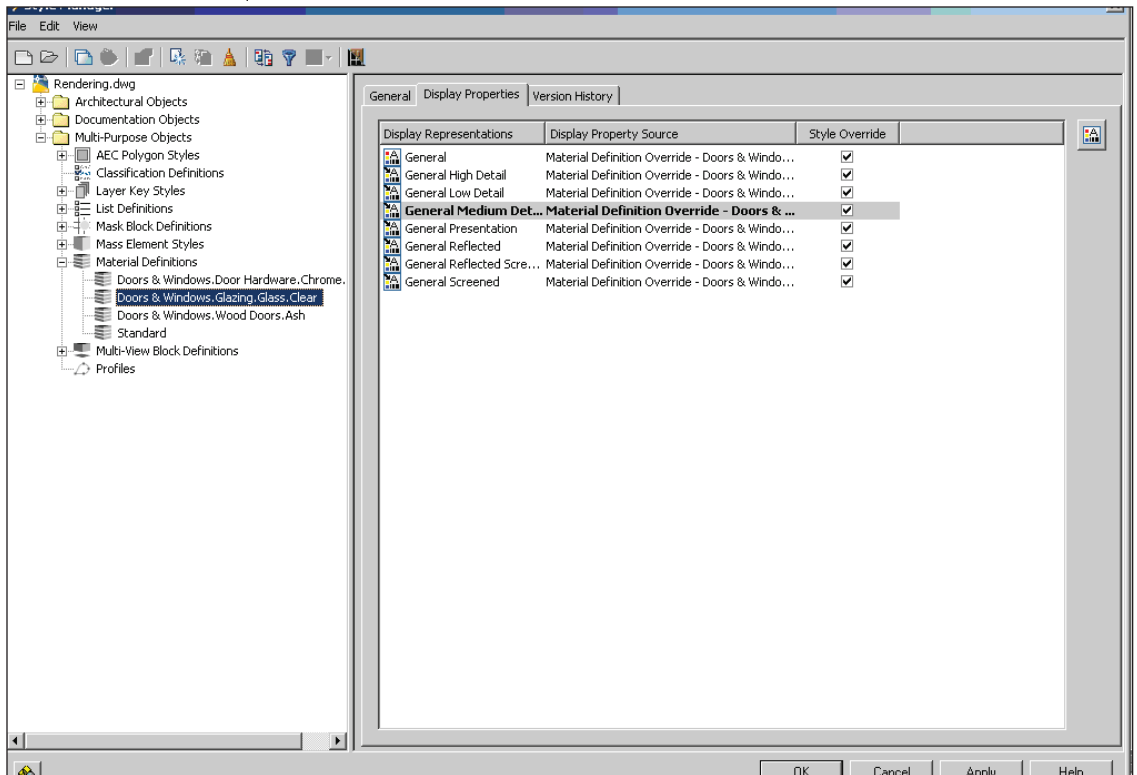


Figure 3: Style Manager

on the materials palette, or apply a material to objects by layer. When applying materials to objects by layer, the material is applied to all objects on the layer whose material property is set to BYLAYER.

Creating materials

AutoCAD Architecture offers quite a number of predefined building material definitions in the drawing templates. All material definitions used in a project are listed under Material Definitions in the Style Manager (see Figure 3).

New materials can be created in the materials window. The materials window can be opened using the command Materials. Click the Create New Material button below the Available Materials in the Drawing panel (see Figure 4). In the Material's Editor section, select a type of material and a template to create your new material. Next, in the Material Editor panel, you can set several properties.

- Realistic and Realistic Metal Types – Materials based on physical qualities

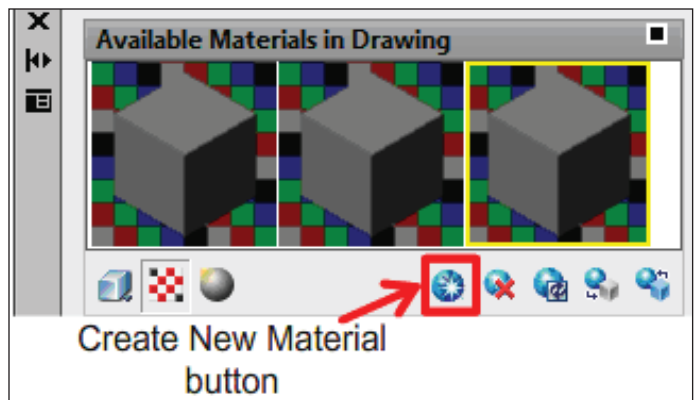


Figure 4: Creating new materials

- Advanced and Advanced Metal Types – Materials with more options, including properties that can be used to create special effects

For materials using the Advanced or two colors for the Advanced Metal material type, you can set three types of colors:

- Diffuse – The main color of the material
- Ambient – The color that appears on the faces lighted by ambient light alone
- Specular – The color of a highlight on a shiny material

It is important to note that the Realistic and Realistic Metal templates use only Diffuse color.

The reflective quality of the material defines the degree of shininess or roughness. To simulate a shiny surface, the material has a small highlight and its specular color

is lighter. A rougher material has a larger highlight that is closer to the main color of the material.

There are other properties to consider as you create your material, including opacity, refraction, reflection, luminance, self-illumination, translucency, and two-sided materials. These can be used to control the amount of light in a given material.

As you create new materials, ensure that you devise a name for each one that allows you to locate it easily later. For example, if you created a material for interior glass that has a tint, you might want to name it *glass.interior.tint*.

Modifying materials

After a material is created and applied, the properties can be modified in the materials window or in the tool palette (if it has only been assigned to a tool palette). The material swatches that are available in the drawing are displayed at the top of the Materials window (see Figure 5). When a material swatch is selected, the properties for the material become active in the material window sections. The sections of the materials window display different property settings.

Available Materials in Drawing displays material swatch previews and tool buttons.

Material Editor displays the material types, templates, and properties.

Maps displays the map channels, map type selection, and tool buttons and provides access to procedural map controls.

Advanced Lighting Override sets parameters that affect the rendering of the material when it is lit by photometric lights.

Material Offset & Preview specifies the Offset and Preview properties of maps on materials.

Material Scaling & Tiling specifies a map channel or synchronizes a scaling and tiling factor to be shared across all map levels. This section is used for 2D maps and map channels.

Now that the materials window is displayed, you will notice that the panels are closed, but they can be expanded by hitting the arrows, showing more options for each property setting.

As settings are modified, they are saved with the material swatch. The changes are displayed in the material swatch preview. When the drawing is rendered again, the changes occur on any objects that have the changed material.

Putting it into practice

Let's put what we have discussed into practice using a door and window assembly style. When assigning a material to a

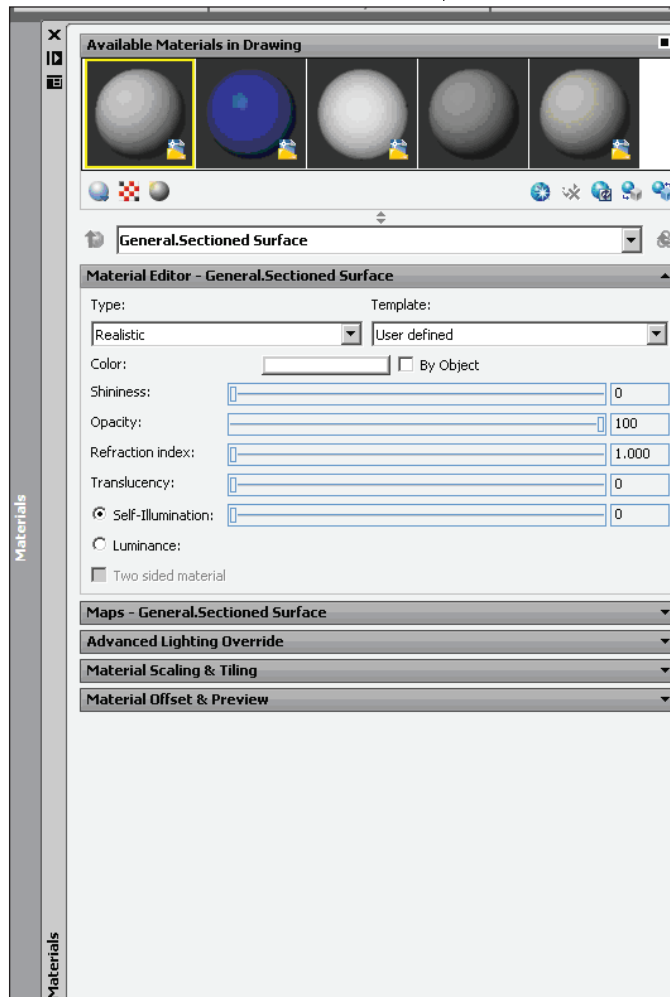


Figure 5: Materials window

door/window assembly component, the component uses the display properties of the material instead of the style display properties. A material can be assigned to any physical component of a door/window assembly.

Begin by opening a tool palette that has a door/window assembly tool. Right-click on a door/window assembly tool and click Door/Window Assembly Styles. Select the style you want to edit and then click the Display Properties tab. Select the display representation where you want the changes to appear and select Style Override. Click the Layer/Color/Linetype tab and select By Material for any component where you want to assign a material. Click OK. Click the Materials tab and select the component you want to change. Select the value for Material Definition and select a different material definition. You can select any material definition in the current drawing or create a new material definition and assign it to a component. Click OK.

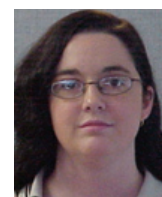
It is important to note that although you can edit a material definition from this dialog box, any changes you make to the material definition apply to all objects that are

assigned the material.

Now let's try simply dragging and dropping a material onto your drawing from the materials tool palette. Choose a material for your outside wall, such as brick. Now drag and drop the material onto a wall and hit enter. Continue trying to apply other materials to objects in your drawing.

Conclusion

AutoCAD Architecture has many available materials that can be used to render awesome photorealistic images for presentation purposes. My advice is to start simple and learn as you go. The possibilities presented by AutoCAD Architecture materials are so endless that one can write enough articles about materials and rendering materials to fill up at least a year's worth of *AUGIWorld* magazines!



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