Better Modeling in ArchiCAD

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Introduction

I am a Virtual Building zealot. Since you're here, you probably use ArchiCAD, and I don't need to give the full pitch on why 3D modeling is the right way to document building projects. But here's the short version:

- Easy 3D for clients. Don't stop working on the project to present a perspective drawing. Clients who understand what they are getting, and are getting what they expect, are much happier.
- **Design development.** Work out the building as a building, not as a series of disconnected images.
- **Structure coordination.** Accommodate the required engineering, before a big beam doesn't fit, or it forces an architectural compromise.
- Virtual construction administration. Make virtual mistakes so you get it right in reality. Fewer surprises in the field.
- **Document consistency.** Faster turnaround for changes, fewer omissions and contradictions in the drawings,
- Quick development of additional drawings and details.
- Reliable geometry reduces the cost of annotation omissions. Better a so-so picture of a generally accurate model than a perfect drawing of... whatever.
- These advantages together mean a happier client and contractor.

Modeling is worth the investment. It is worth it to struggle with the model to maintain these advantages. There are cases where going 2D would save time short term. In the long term, maintenance and errors increase. When you choose to draw, you are borrowing time from the future. When you model, you are spending time now to save it in the future. I model everything I can. When I come up to something I can't model, I stop and figure out how to do it. Sometimes this takes longer than I might want. It my lead me into GDL, where I'm often stretching my middling logic and math skills for days at a time, which can be frustrating. 'James, you've been doing that wavy roof for two days.' I push through it because a model with integrity is a valuable asset.

Like anything, if you model a lot, you'll get better at it and there will be fewer and fewer tricky situations.

I have some solutions that are 'better' than the ones I'm going to show you. I have developed my own D/W, trim parts, structure parts, and curvy construction bits. I'm telling you this so you know that I'm not a non-GDL person. I know a fair bit about it. I will not say, "You don't need GDL!" I believe even a self-identifying non-GDL person can learn a few essentials that can economically help their general modeling ability.

OK, so you should model, and it can be done. Graphisoft makes it sound easy and automatic, which is their right, and it's probably wise business practice. But as we know, even the simplest project will have some conditions that challenge the ArchiCAD toolbox. For some conditions, you just need to use a tool slightly differently, or use a different tool, or just know the tools' limitations. Sometimes you need a trick. (Solid Element Operations are the biggest trick in the book.) Sometimes you need to put the toolbox down and make an object. And sometimes you still need a patch.

What's a Good Model?

The primary function of ArchiCAD is construction documents. There are better free-form modelers, better rendering tools, better methods for schematic design. (Many of them don't require electricity.) ArchiCAD's strength is that you can build a pretty good model using tools with an inbuilt architectural slant, and you can turn that model into documents. When I speak of the model being successful, I'm referring specifically to the context of construction documents, as opposed to a model geared to-ward rendering. A model that's tight enough to give to a contractor in hidden line is probably near ready for rendering anyway.

These are my goals in building a good model:

• Accurate geometry: Gross (size and placement of elements) and fine (dimensional accuracy and rationality). Elements should placed precisely, in clear and consistent relationships to one another. There should be no tiny fractions in the dimensions.

• **Unity:** Redundant elements are minimized. Building parts are represented with as few project elements as possible, within the limits of the tools.

• Cleanup: No wanted lines missing, no unwanted lines showing. Surfaces and in section.

• Scale-intelligence: Scale changes are a fundamental of architectural documentation. The model should adjust itself automatically to changes in scale. (This is actually a weak spot in ArchiCAD, but I can't resist mentioning it. Scalesensitivity is very simple in GDL. Hopefully, in the future, the toolbox tools will be too.)

· Logical Consistency of the model itself:

Consistent layers, attributes, and views. Not just for output, but for the sanity and efficiency of the user. Once you commit to modeling everything, you're going to have a lot of stuff, and you need to stay organized. Dimensional accuracy helps here too. Develop good standards and habits that you take from project to project.

• Keep it Modeled: A good model is easier to maintain as a model. Once you give up and start drafting, you lose consistency, and you also lose some motivation to maintain that consistency. If you unlink the sections because it's hard to get them to clean up, from that point you are drafting on the sections rather than continuing to work on the model. A fresh section through a good model is mostly done.

Limits

ArchiCAD is not perfect, nor is it finished. A great many things are possible, but some things are

not. There are some real limits in ArchiCAD's design, where you must use a workaround. The limits make you draw instead of model, or to use redundant elements. Some examples:

• Doors and windows have only one symbol, and off. Therefore, the structural lintel is separate.

• Objects don't have layers. Layers would solve the problem above, and would allow more complex, unified objects.

• You can't show an element dashed in one view and solid in another. Therefore, you can show soffit slabs dashed in plan and trace them solid in RCP, or show them solid in RCP and trace them dashed in plan.

• There's no 'profile' outlining. Therefore, you outline elevations.

• Surface cleanup is by element, not by polygon. Some junctions clean up and some don't. Therefore, you have to extra-think surface connections, and use fills and patches when lines won't go away.

• Two like walls make a corner. An unlike wall meets the corner, in line with one wall. The corner line remains. You need a patch.

• There is no background-only cover fill display option. Therefore, if you want roof geometry, without the hidden parts, and no 'shingles', you need lines.

• There is no differentiation in section cleanup between meeting another element and meeting air. You're stuck with a heavy line, for example, between a wall and a window.

• There is no centerline recognition in the dimension tool. Therefore, you place the centerline notation separately, and it doesn't smartly follow the tickmarks.

One of our jobs as users is to know the limits, know the workarounds, and wish for the limits to be moved.

Our Workflow

I don't do standing-start schematic design. My work on a project generally consists of design development and CDs. Our early DD might be someone else's mid-schematics, though. When I start work, I typically have a clay massing model, pretty well-developed sketchy plans with general dimensions, and 1-2 sketchy elevations. Since we do traditionally-styled work, I also have a good idea of the imagery and vocabulary.

The first step is to rationalize the plans. Then I reconcile the plans and the massing; do the rooms fit under the roofs? Next, I compose the elevations, gradually working into the exterior detailing. The plans and elevations will look very advanced while the sections are still barren except for the floor slabs. (I do believe that the stairs should be worked out very early.) We do hidden-line perspectives and VR objects, nothing fancy. Perhaps weirdly, I place the zones at this stage. You can update them!

When we and the clients are satisfied with the plans, massing, and elevations, we start serious work on the sections. This is when we start folding in the structural engineering. This stage always causes backtracking to the massing and the exterior detailing, at least a little. We cut a lot of sections for the documents, and many more sections for investigating the model. We also 'block-up' details; we cut the main exterior details as detail windows, and work with them essentially as model views. No annotations yet, so it's cheap to rebuild-from-source as we're tweaking. We maintain the reference of markers of all the drawings as we go.

If the clients are happy, and we're happy, and the engineers are happy, the basic geometry of the building is done. (If annotations were truly automatic, we could hand the project over at this stage.) This is when we start the CD annotations. We still maintain everything as model views. Especially in residential, things keep changing even when they're not supposed to.

These are our main annotations:

- Dimensions, roof slopes, 2D framing/ foundation plan stuff.
- · Wall-section enhancements.
- · Developed 2D details in detail windows.
- Labeling of materials, rooms, structure members in section.
- · Window/door and finishes lists.
- Graphic elements such as elevation outlining.

We often develop the fine interior modeling in the CDs phase as well.

That's it. Because the geometry is reliable, when the contractor wants another section or detail, or needs a dimension we left out, it's quick, easy, and, most important, accurate.

Good Habits

Big picture:

• Stay organized. Be consistent. Use color to differentiate parts of the model. Keep your templates up.

• Use favorites, but don't go overboard. Too many favorites is no better than wide open tools in the first place. The favorites should offer the most important few settings of the main tools.

• Don't draw *anything* you can model. Try to make only one thing. Instead of a group of lines, a polyline. Instead of a closed polyline, a fill. Instead of a fill, a slab.

Q: Why are you drawing that?

A: Because I asked ArchiCAD and it said no.

• Do everything as needed. If it doesn't show up in any view, skip it. If it only shows up once, and it's a major hassle to model, consider faking it. If you're not presenting sections yet, cut the sections some slack.

• It is often better to throw down an element and then edit it, rather than try to set all the settings beforehand.

• When you find an instance of an element that's wrong, use find & select to fix all the instances, right now, before you forget.

• Print. No matter how good your vision or your monitor, some problems only jump out on paper.

• Know the limits. Don't try the impossible. Stick to the hard stuff!

Usage Tips:

• Use the keyboard. It's much faster. If a command doesn't have a shortcut, give it one. Save your work environment.

• Transfer values with copy and paste among the T & B fields in the Info Box, and the X, Y, R fields of the coordinate box.

• Undo/redo. To select something you just placed or pasted. To see what elements are affected by a marquee stretch.

• The project origin is your friend. Build the model so it has a rational relationship to the origin. It can be the front door, or a corner, or an offset. When some part of the model is 'off', you can measure from the origin to find the problem

• Stretch the Info Box. You need the settings dialog less than you might think.

• Cut lots of little sections. It's often easier to measure and verify the model in a section window. Short sections generate very quickly.

• Drag in section rather than elevating in plan.

• Use the 3D window for solid element operations, roof editing, wall trimming, find & select for multiple stories. Use marquees to limit the 3D view, and turn the fills off when you're not using openGL.

About Rill & Decker

I am responsible for all ArchiCAD/IT/production/ standards/libraries/training at Rill & Decker Architects. We are an award-winning all-residential firm, with about 45 projects at various stages at a given time, from small additions to very large homes. We have eight ArchiCAD users, but neither principal, Rill nor Decker, has ArchiCAD on his/her PowerBook. Mac shop.

I have a B.S. in Architecture from Florida A&M, 1993. I took my final year at the Virginia Tech center in Alexandria, VA, that's how I got to Washington DC. ArchiCAD user since 5.1. GDL since 1999. Virtual building zealot. We use inhouse (by-me) developed windows, doors, mouldings, structure pieces, and symbols. We emphasize complete modeling, knowing the building, and solid documentation.