Builder CAD
For Less Than $1,000

Two old-school and two new-school approaches to 2-D and 3-D design

by Joe Stoddard

Take a look at the discussions on *JLC* Online's computer solutions forum (forums.jlconline.com/forums/forumdisplay.php?f=3) and you'll find the perennial CAD thread called something like "Chief vs. SoftPlan vs. VectorWorks vs. Cadsoft vs. AutoCAD vs. whatever else." By now, everyone should realize that if you're willing to spend a grand or more, you can purchase a license to a full-featured, professional, architectural-specific 2-D/3-D CAD system.

But what if you do design work only occasionally, or need only basic drafting capability? Simple room additions, decks, built-ins, and the like still require thorough and accurate design, but do they warrant purchasing a high-end CAD system? And what about the claims of "instant material lists"— can you trust any of them?

In the January 2001 issue of *JLC,* I took a look at several low-cost and no-cost design systems and concluded that if you were willing to learn how to use multiple products — one for 2-D drafting, another for 3-D visualization — and then endure some annoying work-arounds, you could produce acceptable client work with software costing a few hundred bucks or less.

This time, I wanted to skip the work-arounds and find options that would provide a decent end-to-end design solution on a reasonable budget. I originally set the bar at around $500, but quickly found that I was a couple of hundred bucks low. However, I was able to find capable 2-D/3-D packages for under a grand.

I focused on the three general functions a *JLC* reader might need: 3-D presentations, working drawings, and CAD-assisted estimating. With those functional areas in mind, I spent the last few months soliciting, installing, and testing dozens of CAD products.

The vast majority were too generic or too simplistic, or required a rocket scientist to figure them out. So for this roundup, I settled on four product families: Cadsoft's Envisioneer and

CAD Comparison Chart

	Ease of use	Flexibility	Design with precision	Work in 3-D	Create objects on the fly	Save/manage components	Working drawings	Estimating/bill of materials	Photographic realism	Best for:	Price	Comments
Envisioneer www.cadsoft.com	4	4	3	4	4	3	3	5	5	CAD-assisted estimating	$795	The best CAD-assisted estimating with object-based 3-D and stunning rendering.
3D Home Architect www.3dhaonline.com	4	1	1	3	2	1	1	2	5	Learning Envisioneer	$90	Good way to learn Envisioneer. Useful for under $100.
DataCAD LT www.datacad.com	3	3	4	2	3	3	4	4	3	Bang for the buck	$300/ $345	For under $350, a complete professional 2-D/3-D system.
IntelliCAD/ArchT www.intellicad.org www.autodsys.com	2	3	5	2	2	3	5	3	3	Precision drawing	$700 and up	IntelliCAD/ArchT will make sense if you're familiar with AutoCAD.
SketchUp Pro www.sketchup.com	5	5	3	5	5	5	1	2	4	Design and presentation	$495	If you do custom design work, you need SketchUp. This is the way all software should work.

Rated on a scale of 1 to 5, 5 being the best score.

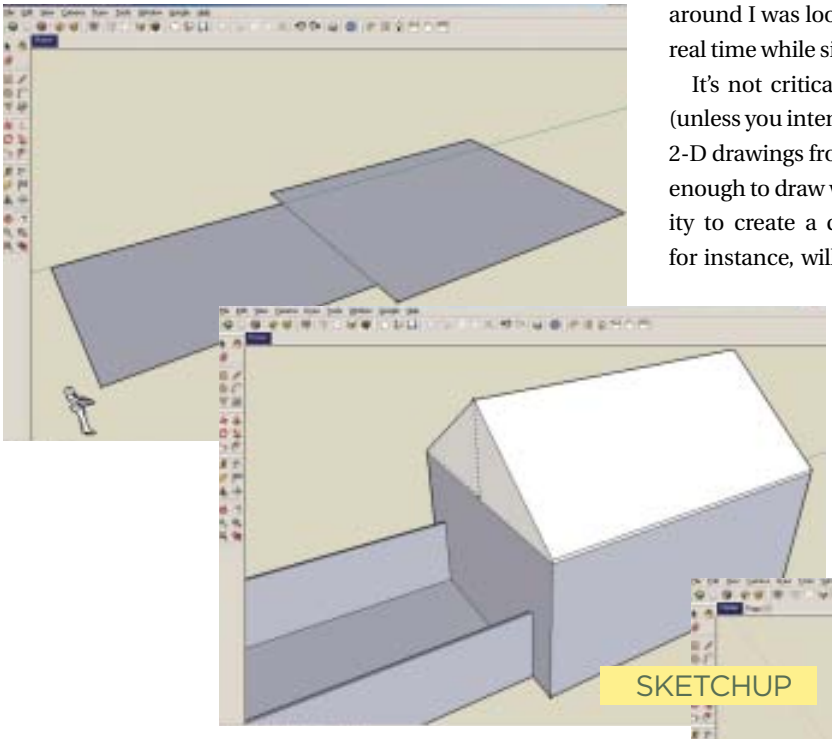
little brother 3D Home Architect, DataCAD LT 11, IntelliCAD plus ArchT, and the wild card — SketchUp Pro. Not all of them satisfy every one of my three functional criteria, but they are all worthy additions to your digital toolbox if you accept their limitations.

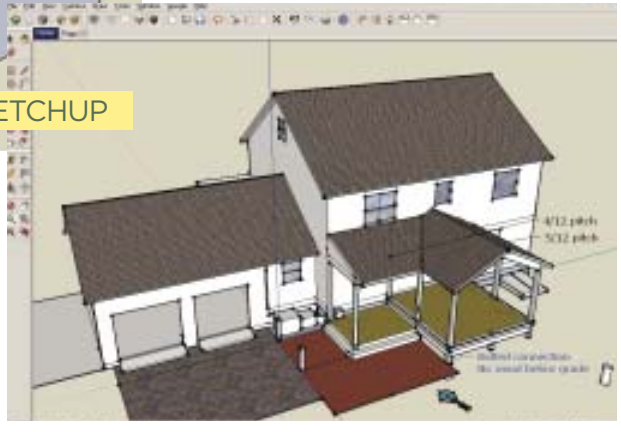
3-D Presentations

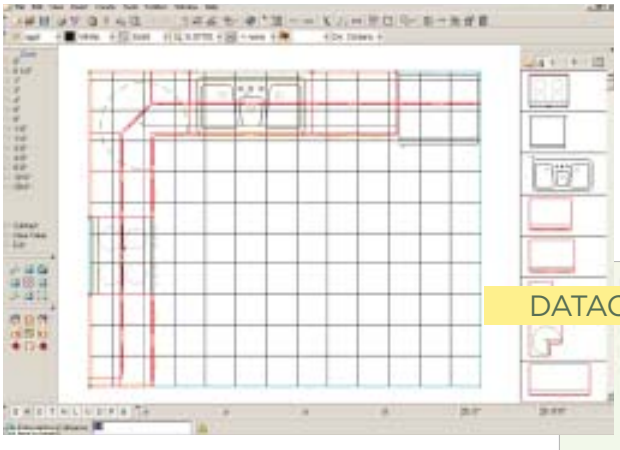
I wanted the ability to quickly and accurately create a 3-D model of a project for sales presentations or to clarify construction details. Back in 2001, I suggested using an image editor like Paint Shop Pro or Photoshop to patch up whatever the low-cost CAD couldn't handle, and that is still an option. But this time around I was looking in particular for something I could use in real time while sitting face-to-face with clients, with no fudging.

It's not critical that the 3-D model be accurate to the inch (unless you intend to extract your bill of materials or "slice" your 2-D drawings from it), but the software does need to be flexible enough to draw whatever it is you're planning to build. The ability to create a custom-turned bun foot on a kitchen island, for instance, will be a whole lot more important than whether you get 2,500 different 3-D shrubs or 800 carpet patterns, as you do with consumer CAD products.

Can you add exposed rafter tails, or are you stuck with a flat soffit? What about an oddball-sized gable dormer with a different







SketchUp is unique in 3-D design because you draw directly in 3-D space, the same way an artist would sketch on paper. Most 2-D/3-D CAD is more like DataCAD; it forces you to work in a 2-D view, and then generate 3-D in a separate window.

pitch than any other roof on the building, a trapezoidal window above the plate line, or a complicated built-in under the stairs?

Of the products reviewed here, SketchUp is by far the king of working directly in 3-D space. 3D Home Architect and Envisioneer both let you add and edit items in 3-D (initial drawing is done in a 2-D floor-plan window), while DataCAD LT and IntelliCAD/ArchT are more old-school: You do most of your drafting in a 2-D window and have to load a 3-D generator to see the results.

Working Drawings

Although 3-D may rule for presentations, the job site still runs on flat drawings. Unlike generic 2-D-only CAD, builder-specific 2-D/3-D should give you a running start on your working drawings by allowing you to create automatic elevations and building sections from your 3-D model, and then use built-in 2-D CAD tools and notes to dress them up for construction drawings.

All of the products reviewed except SketchUp and 3D Home Architect have precision 2-D capability, and even SketchUp can give you rough elevations — as well as sections and floor plans — by simply slicing the 3-D model. 3D Home Architect has no 2-D drafting capability at all, making it practically worthless for working drawings, but it does allow you to add dimensions to floor plans and notes to various views for presentations.

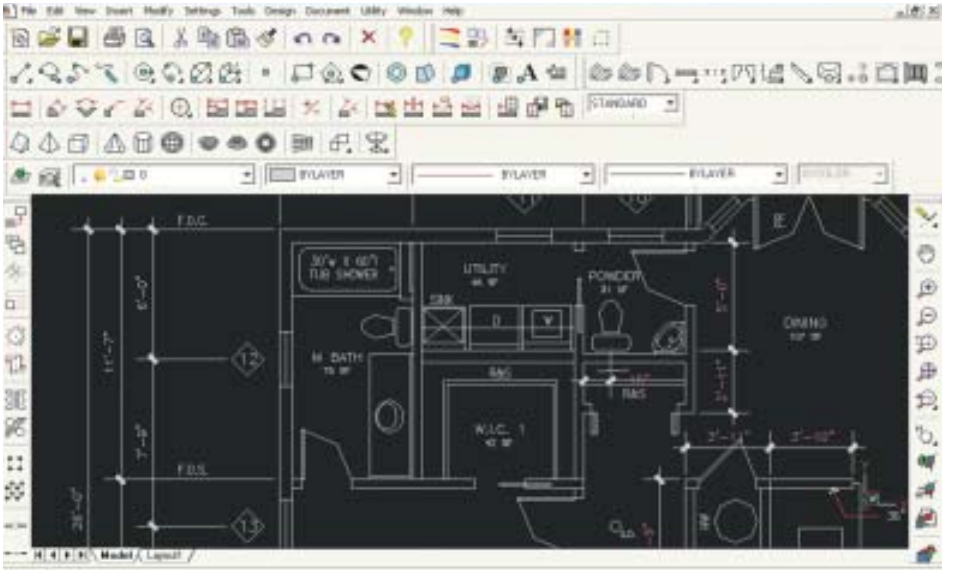
Conflict checking. We've all had that set of plans where the ductwork runs through the skylights because somebody didn't bother to check drawings for consistency. Even if you're starting from a very complete 3-D model, these errors can still occur with 2-D/3-D CAD unless you can overlay your floor plans in some way to check for conflicts. DataCAD LT, IntelliCAD/ArchT, and Envisioneer all do well in this regard.

SketchUp sidesteps the problem: You draw the entire model in 3-D and then slice it to create the flat drawings — which, if you've drawn a complete model, makes conflicts more obvious.

Dimension options. At a bare minimum, 2-D CAD features should give you the ability to draw quickly with precision and apply "associative dimensions," which update automatically when you move something. You also should be able to apply extension lines and dimensions from both the center of objects (for window placement in a wall, for example) and the edges of an item (for dimensioning a building to face of stud).

There should be a way to save reusable 2-D symbols (or "blocks") so you don't have to reinvent the wheel with every drawing. Every product in this review has some kind of symbol navigator to make it easy to add your saved items to a drawing.

And finally, for bonus points, you should be able to print multiple drawings at different scales on the same sheet, say a floor plan at 1/4 inch = 1 foot and a cabinet detail at 1/2 inch = 1 foot. Of the products in this round-up, only the IntelliCAD/ArchT bundle has that capability.



Good working drawings — like this one produced in IntelliCAD — require the flexibility to determine how dimensions appear, manage line weights and layer visibility, and print multiple scales on the same sheet.

CAD-Assisted Estimating

Everyone wants the ability to generate an accurate bill of materials based on CAD drawings, something every $30 "design" package at the big-box office supply claims to do. But for this feature to be useful to a contractor (and not just a toy for a homeowner), five things have to be true:

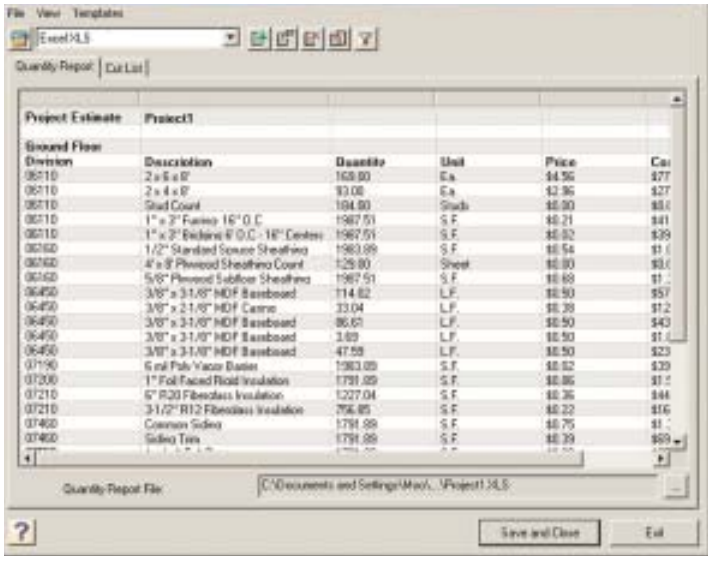
- The objects on the drawing must represent reality (the wall you're drawing must have all the attributes of the wall you will actually build).
- The software must be able to accurately count and report

what's directly on the drawings (the LF of wall, or the number and type of shower units or exterior doors).

- The software must be able to calculate, or "extrapolate," related materials to your specifications, based on known quantities of other items. You might use more or less rebar in your foundation than the next guy.
- You have to be able to define those items. "Tubes Construction Adhesive" and "Boxes Gun Nails" don't mean a thing unless you know they're *quart* tubes and 5,000-fastener boxes.
- Finally, you need to be able to get a bill-of-materials (BOM) report out to Excel or some other estimating software.

None of the consumer-related CAD programs I tested, including 3-D Home Architect, could fulfill all of those requirements. They could count but not calculate; or they could calculate but wouldn't allow me to change what was being calculated — for example, the materials that I wanted to use in a 2x6 wall.

Envisioneer's configurable materials database makes it one of the best CAD-assisted estimating products available today at any price.



Like more conventional 2-D CAD programs, SketchUp Pro can count and report on the number and type of components in the model, but since you're not defining objects for walls, framing, and so forth, a basic window or fixture schedule will be the best you can do, and that will require programming.

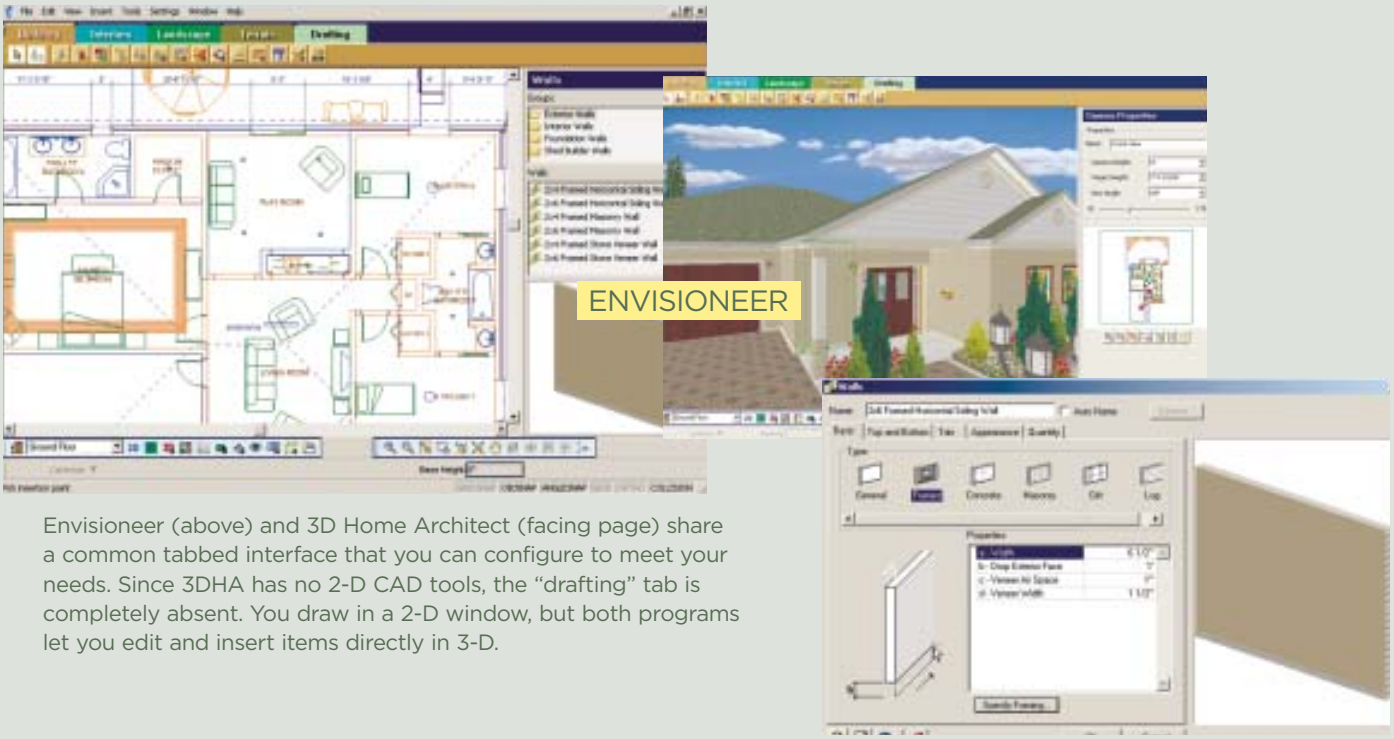
IntelliCAD/ArchT creates the lists and counts, but requires third-party estimating software (or a good programmer) to actually get the information out into a usable report.

Of the packages in this roundup, only one — Envisioneer — shines in the estimating realm, with a fully configurable materials database and complete flexibility about how those items take off from the model.

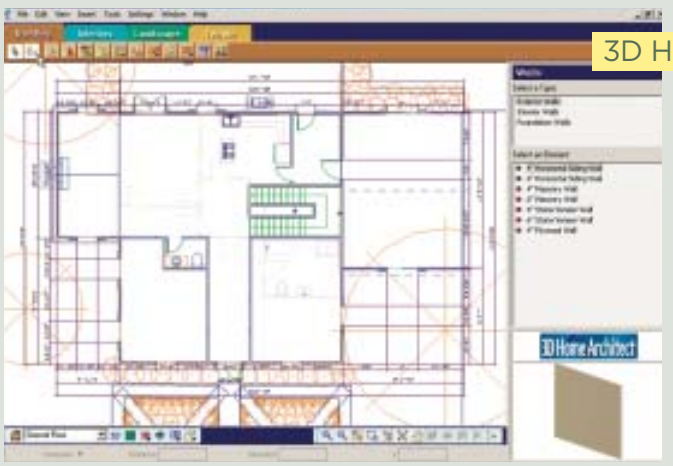
Cadsoft Envisioneer ($795) and 3D Home Architect ($90)

Envisioneer is often overshadowed by Chief Architect and SoftPlan, but it has quietly evolved into a true contender in the 3-D/modeling/estimating realm, especially if your 2-D drafting needs are modest. And it excels as a bill-of-materials generator. Envisioneer does this by maintaining a true database of elements that feed the drawing model, which are completely configurable by the user.

3D Home Architect (formerly known as Design Apprentice) is a consumer version of Envisioneer with several key features turned off. Most notably, 3D Home Architect (3DHA) has no 2-D drafting tools at all, and while both products share exactly the same bill-of-materials engines, only Envisioneer gives you the capability to configure anything beyond the highest "element" level (see screen shot, above).



Envisioneer (above) and 3D Home Architect (facing page) share a common tabbed interface that you can configure to meet your needs. Since 3DHA has no 2-D CAD tools, the "drafting" tab is completely absent. You draw in a 2-D window, but both programs let you edit and insert items directly in 3-D.



By checking the "commander" in 3D Home Architect, you can draw with the same accuracy as in Envisioneer.

3DHA almost didn't make the cut here at all, until I discovered that by tweaking some settings, I could draw 3-D with precision — just as in Envisioneer — making it pretty good for presentation work.

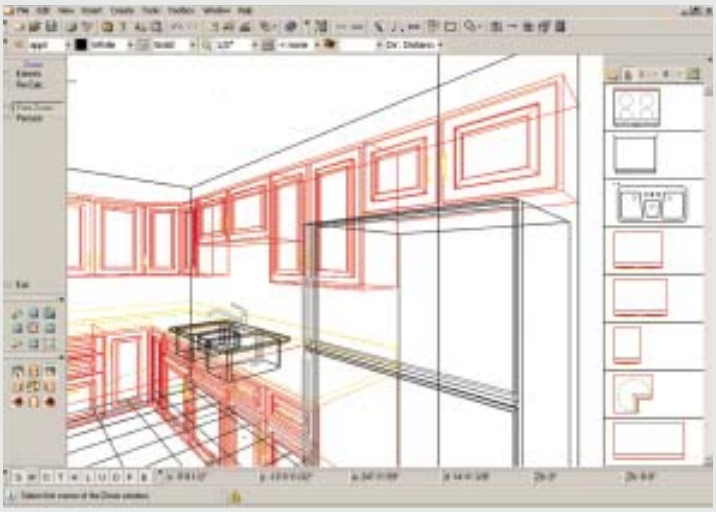
3DHA does not support cavity walls; in other words you can't layer up brick/sheathing/studs and have it display as multiple lines in floor-plan view. The best you're going to do is make a 9-inch-thick wall and apply a brick surface to the outside.

3DHA's bill of materials, while nothing like Envisioneer's, is not totally useless. Even though you can't configure "elements" (assemblies) as you can in Envisioneer, you can still get accurate counts on things like windows and doors and plumbing fixtures, and you can still get usable area calculations — for instance, total wall area. That's not going to produce a lumber list you can drop in the fax machine — something Envisioneer can do, if you're willing to spend the effort setting up your data — but if you're just doing some preliminary cost estimates, that information can be plugged into Excel or another estimating program.

Envisioneer and 3DHA also share a common file format, so you can pick up the $90 version, and if you like how it draws, you can upgrade to Envisioneer (the company will give you a $100 credit) and not lose any of your work. Both products have an interesting tabbed interface and overall are pretty easy to learn.

DataCAD LT 11/o2c ($300/$345)

DataCAD has been around since the '80s and has been developed and supported largely by its army of architect/designer users. Rest assured that despite being old-school, it'll get the job done. Furthermore, you'll have a global community to tap into for help if you need it. Some cities even have active user groups who meet regularly in person.



DataCAD was one of the first building-specific CAD products on the market, and LT has most of the critical functionality of the pro version. As with other 2-D/3-D packages, you work primarily in 2-D and then generate 3-D views from the resultant "model." The program o2c Interactive adds the ability to render your 3-D model and share it on the Internet.

The pro version of DataCAD 11 costs $2,000, but for $300, you can buy a seat of LT (light) and get 80 percent of the features and functionality and pretty much everything you need to design and draft the kinds of projects *JLC* readers would normally undertake.

What's missing from LT are perks like the DCAL programming language and advanced XREF and linking, features in Pro that allow architects to automate and manage large, complex project sets but that the typical *JLC* reader would probably never need. If you do need those features, you can always upgrade to Pro, and you'll get a full credit for what you spent on LT.

As with IntelliCAD, DataCAD's tools are classic CAD — you'll have to master concepts like "ortho mode" and "selection sets" — but the drawing tools are accurate and complete. DataCAD features automatic door and window insertion, associative dimensioning with plenty of configuration options, and unlimited undo/redo. Also like IntelliCAD, DataCAD was on the edge of the OpenDWG movement (which essentially reverse-engineered Autodesk's proprietary format), so its DXF/DWG translators work perfectly, making it possible to share DataCAD work with any AutoCAD-aware program.

In DataCAD, you work primarily in a 2-D window and get "3-D for free" by virtue of walls, windows, doors, cabinets, and fixtures all having a built-in Z dimension (height) that shows up as 3-D.

For presentation work, DataCAD LT supports o2c Interactive (o2c stands for "objects to see"); if you are willing to spend another $45, you can buy an LT/o2c bundle that allows you to share your 3-D models with clients via the Internet.

IntelliCAD plus ArchT ($700 and up)

ArchT has been around for years as an AutoCAD add-in. More recently, the technology was picked up by the IntelliCAD Technology Consortium and is now available for the open-source IntelliCAD. That brought the price down considerably.

I included ArchT in this roundup because it's one of the few packages out there that give you SoftPlanlike or Chief-like drawing automation for less than $1,000. If you buy an ArchT/IntelliCAD standard bundle from Autodsys, you can get in on the ground floor for around $700. (Note that several IntelliCAD Technology Consortium partners have created their own flavors of ArchT, some of which are more capable and more expensive than others; Autodsys is the least expensive I could find.)

So, keeping in mind that IntelliCAD was created as an open-source rebellion to AutoCAD, how does it stack up? It is 95 percent as capable as AutoCAD and every bit as complex. If you want infinite control over your 2-D drawings with some 3-D capability thrown in, this product is for you.

Drawing with IntelliCAD/ArchT is similar to drawing with AutoCAD/ArchT: You can pick from menus or icons, or you can type keyboard commands directly in the command line. ArchT inserts a menu/toolbar of options that connect the lines and boxes in an IntelliCAD drawing directly to 3-D building objects.

As you would expect, there are wall types, cabinets, windows, doors, and so forth, and you can add and configure your own to your heart's content. You can draw walls on the fly, or you can pick existing lines on a 2-D drawing and convert them to walls.

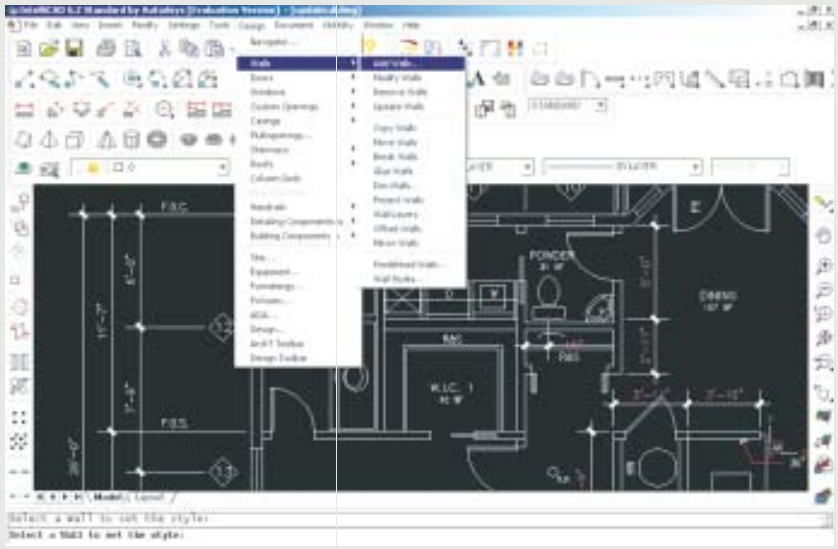
ArchT inserts a "baseline" layer that tells the software where your walls start in 3-D space. This baseline is key, controlling everything from how the walls intersect and how components like windows and doors are "built" to how materials take off from the ArchT model.

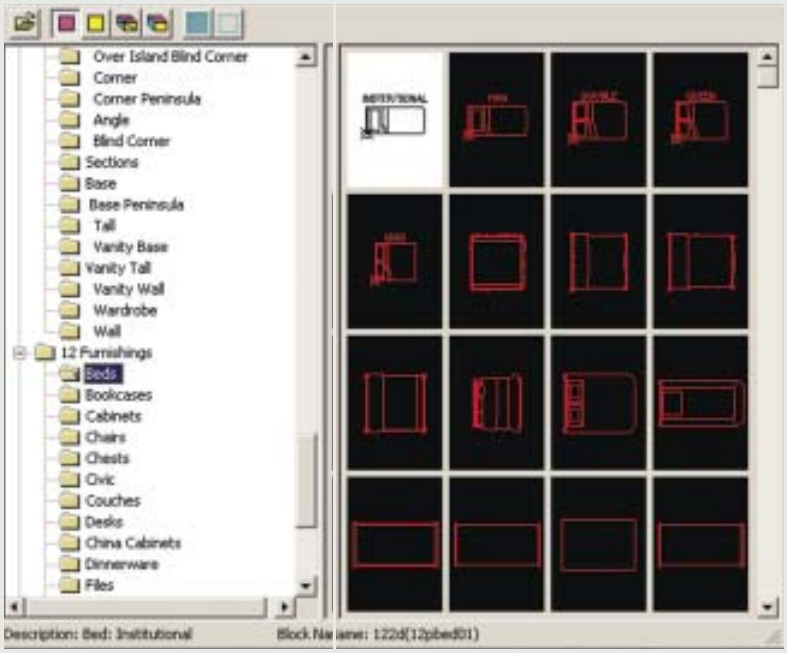
The Autodsys/IntelliCAD version of ArchT does not yet support floors and ceilings, a major flaw in the ability to use ArchT for CAD-assisted estimating. (The capability has been promised for the next version.)

To generate a bill of materials in ArchT, you have to attach an "estimating record" to either an ArchT assembly (a one-at-a-time ordeal) or to a "style," which automatically adds that information to all the assemblies in a drawing that use that style — "stud wall," for example.

Out of the box, you can generate only basic "count"-type estimating reports — window, door, and fixture schedules, for instance. If you want more than that, you'll need a seat of Timberline Precision Estimating along with Timberline's CAD Link add-in (or you'll need to make friends with a good programmer).

Nor is presentation work a given in ArchT, unless you make use of a third-party rendering product or upgrade your IntelliCAD to the Pro or Pro Plus versions (an extra $100 to $200), which have rendering and lighting built in.





ArchT adds intelligence to IntelliCAD by making libraries of building objects (walls, windows, doors, fixtures) available for linking to the 2-D drawings; this can be done through menu items or with the ArchT navigator. You can generate decent presentation work if your version of IntelliCAD supports rendering.

SketchUp Pro ($495)

Technically, SketchUp isn't builder-specific, but it was developed by architects and is used widely in the building community. If your goal is to quickly and accurately convey 3-D design ideas to your clients and subs, you need SketchUp — simple as that. At full price it's a bargain, and with a (nearly) fully functional free version to learn on, there's simply no reason not to download it.

In fact, some major CAD vendors, such as Graphisoft (ArchiCAD) and Autodesk (AutoCAD, Revit), now have direct SketchUp plug-ins because creating individual 3-D items in SketchUp is so much faster and easier than in their native software. SketchUp Pro can import and export in a variety of 2-D and 3-D formats, including .dwg and .dxf, so you can share work in two directions with other products.

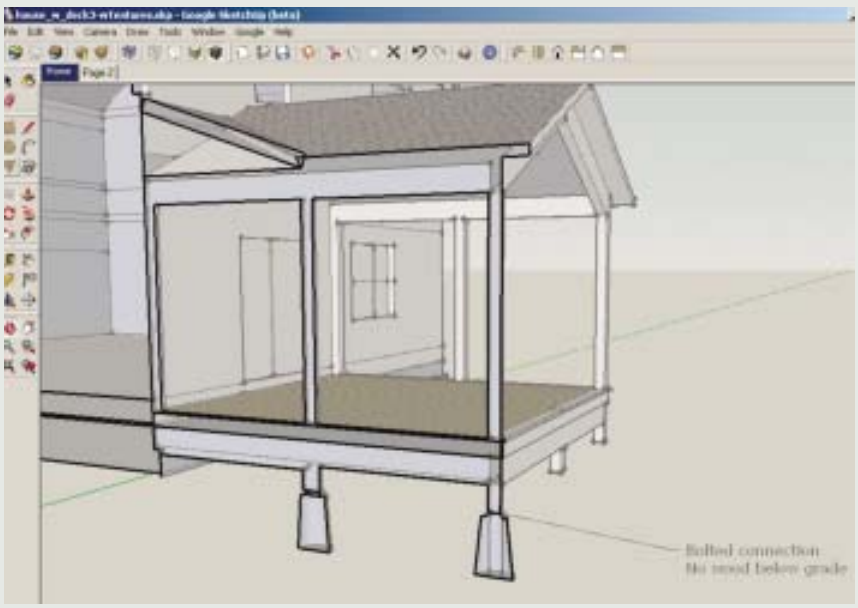
With SketchUp — unlike with conventional CAD — you don't work in 2-D at all. Instead, you click and drag various primitive shapes (rectangles, circles, and the like) directly in 3-D space, then push and pull on surfaces to transform the 2-D shape into a 3-D object. An ingenious behind-the-scenes "inference engine" — coupled with the task-bar "value control box" — lets you draw and drag with as much or as little precision as you like.

You can group and copy items in a drawing, or you can save part of your drawings as a 3-D "component" (a door, a bath fixture, an entire room, or even an entire building). Commonly used commands can be programmed into single keystrokes or key combinations, so once you know how to get around — which doesn't take very long — you can work without ever having to look at the keyboard.

Since users are not limited by predefined building components, SketchUp works well for custom builders and remodelers in ways that many traditional 3-D CAD applications don't: The odd-shaped deck with the curved wrought-iron rail is no problem, for example — and neither are the custom built-ins under the staircase. If you need something new, just create it on the fly and save it as a component. SketchUp does nothing to block creativity: If you can imagine it, you can probably model it quickly and easily.

Strictly speaking, SketchUp is not a "precision drafting" program, but it does offer enough associative dimensioning and notation to help you get by for presentation work and even for simple working drawings.

Interestingly, though, if you're using SketchUp as it was designed to be used, your need for traditional flat CAD files will probably be reduced, because interacting with the 3-D model offers so much more information in the first place. To generate flat views like floor plans and structural sections, you simply slice the model with the Section Plane tool and drag the plane to what you want to see. If needed, those flat files can then be imported into a precision CAD product for further processing.



This scaled model, sectioned exactly as shown, took me only a few minutes to create in SketchUp. Once you learn the basics, drawing with SketchUp is as natural as drawing with a pencil. The difference is that you can spin and slice your model on the fly.

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