

# From The Castle

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## The Year in Review

This past year at Runkle Consulting, Inc. has been exciting and fast paced. I would say this is the year we became a company. In the past years, the “company” was me working out of the fourth bedroom in my house. When the dining room started to overflow in paperwork, I rented a room in an old house that was converted to office space. It was actually really a nice space, there were a number of tenants there, we shared a kitchen, waiting room and so on. I loved the space, and the people were great. A little over two years ago I hired Greg Wagner, but before we even had much of a chance to get going as a two man outfit the Air Force called me back in from the Reserves, and I spent an extended vacation in Kuwait and Iraq all paid for by the US Govt. Greg in the meanwhile got “free” a good share of the “company” (it’s was like getting a good chunk of nothing, which was about the worth of the business at that point).

Upon my return in late 2005, I noticed there was a change in clientele and the business. Something had changed in the months I was gone, Runkle Consulting was becoming a company. The remaining part of 2005 was agonizing. The computer system wasn’t up to what we needed with file sharing, and the admin work was killing us. On top of that, November and December brought on the hellish traffic of Christmas, and Greg and I were working as late as 9 PM at night in the field, much of it sitting in traffic.

Meanwhile, we outgrew our

office space. It was excellent for us when our only business was inspections, but the layout wasn’t working as we went more into design, and Greg and I found ourselves really pressed for space.

So, in 2006 we made big changes. First, we rented a real office. We set up a network to make the computers run more efficiently, with some items that helped us work remotely more easily, like an FTP (file transfer) site, and remote access to our computers. I can run any PC in my office from my home, and so can Greg. The second step was buying brand new furniture. Our office furniture that we had in the old place worked, but it looked like stuff you find on the side of the road. We also got Diane Walter to come to work for us. Diane had been helping us out on a part-time basis while I was gone, and she is one of the best office managers I’ve ever worked with. Now Greg and I could stop arranging (or messing up) the files, the bookkeeping could get better organized, and we could focus on our work.

Over the past year design work steadily increased. We bought better software to help speed the process; the most important package we purchased was a 3d Finite Element package, which allows us to completely model a building. We partnered with Diamond Multimedia in Shanghai, China, and they are taking care of more and more of our CAD work. The advantage of working with them is the time differential. They are 12 hours off from us, so I can send them a drawing in the evening and have it in the morning. Also, my son, Jay works for us part time doing CAD drafting, and he will be going more and more into design as he learns the business.

The final and biggest change of this year was our decision several weeks ago to completely drop third party inspections for home builders. There are a number of reasons for this change; the most important is it was physically killing us. Being stuck in traffic three to five hours a day is wearing, and it allowed no flexibility in scheduling our work. We have requested all of the counties and cities to take us off their lists, and we are not accepting any third party inspection work.

I hope you all had a good year, and have a Happy Holiday and Merry Christmas.

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## Finite Element Modeling

The biggest change in structural engineering that has been brought about by computers is the ability to design structures with a system called Finite Element Analysis. Finite Element analysis is a system of breaking a structure down into small pieces, and each piece is analyzed to determine the effects on the whole. You end up with a lot of equations, and a lot of unknowns. I worked these kinds of problems in a graduate course I took, and doing it by hand to make an understatement is so painful a root canal looks fun by comparison. The tediousness of solving all the equations is too much for even the nerdiest among us, so I believe the whole system was simply a curiosity played with by academics with too much time on their hands and no social life. Then with the introduction of computers, the system turned out to be not so difficult. As a rule of thumb, the harder it is for a human to do something, the easier it is for a computer and vice versa. Solving hundreds or even thousands of equations simultaneously is not a big deal for computers.

For years, it generally was the big firms that used Finite Element Analysis. The problems were solved on mainframe computers, and were used to design massive structures. This started to change with the introduction of PC's. When I worked for Robert and Company in downtown Atlanta, the structural engineers told me that without such computer programs, we could never even hope

### Schedules and Human Beings

We try as hard as we can to keep our design work, investigations, and other work on a tight schedule. However, we do ask you give us as much notice as possible, and understand that we are subject to the problems normal fallible humans have. For example, I had to have a tooth removed two weeks ago, and I was in a lot of pain and sick for quite a bit of time after that. Keeping appointments, and doing structural

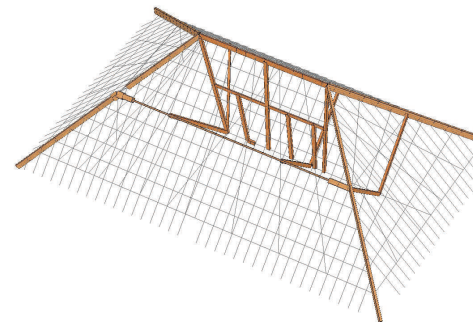
to design aircraft hangars like we did. Older aircraft hangars are boxy things, with repetitive trusses. Even those required thousands of man-hours to run the calculations. Today, aircraft hangars have more efficient shapes that conform to the shape of the plane and leave little wasted space. This type of design would take years without a computer.

So, looking at how Finite Element Analysis made a change in aircraft hangar design for Robert and Company, it occurred to us that MAYBE we could use the system to model houses and create more efficient designs, and accommodate some of the more difficult things architects want to do. So, we did a lot of research, and tested several trial programs to find what we could use. The program we bought cost us a few thousand dollars, but has given us the effect of having a third structural engineer. We can now build a model of a house and continually manipulate it. To give you an idea of what this program does, a roof I designed for Artisan Homes requires the program to solve about 4,000 equations, and takes it 13 seconds to do that! We can add beams here and there, change beam sizes, materials, and apply combinations of loads. It's not a big deal to check a building for dead and live loads, and add wind loads from any direction. I can change a beam from steel to LVL and see how it works, we can throw in all types of built up sections of steel. I can take a house

and substitute Southern Pine for SPF and recalculate the results in about three or four minutes.

What's the end result? We can tighten up our designs to eliminate waste. We can keep bracing to a minimum, cut down the numbers of LVL (laminated veneer lumber) beams in the roof, and apply novel solutions. In our most recent design, we provided the structure of an extremely long and narrow house that is three stories high. The front and back are all windows, so we couldn't use the typical sheathing on the outside. So, we modeled a set of bracing frames hidden in the structure, keeping it stiff in the required wind loads. The bracing frames are LVLs, and we're making them easy to construct.

Of course, we continue to create our own structural drawings, not just marking up architectural drawings. Whenever we can, we coordinate our designs with the builder so what we draw is what he can build. Our aim is to be the best in what we do, and we are going to be the top residential structural engineering firm in the county. Not in quantity, we may forever stay small, but we'll be the best in quality.



A 3D model of a roof we designed on a home being built by Artisan Homes in Atlanta. The model allowed us to greatly reduce bracing and beams, significantly cutting material and labor costs. By the way, 4,160 equations were solved by the computer for this model (in 13 seconds).

design is hard when it hurts to open your mouth. One year Greg got bitten by a copperhead, and his productivity dropped dramatically. The point is, try to put some leeway in your schedules. A lot of unplanned things happen, and we ask you make allowances for that.

We look forward to working with you in 2007.

George and Greg