VirtualWork
A newsletter for customers and friends of IES

Advanced FEA Meshing

Automatic Plate Mesh Issues and Solutions

Meshing Is Easy and Automatic

A number of IES products can perform automatic plate meshing for you, including VisualAnalysis Advanced, VisualFoundation, and the new ConcreteBending. In general, you can simply define your structure's geometry and the software does all the work of generating individual plate elements. For most structures and configurations that is the end of it. You should, of course, continue to use mesh refinement to insure that you are getting good analysis results.

You Still Need to Think

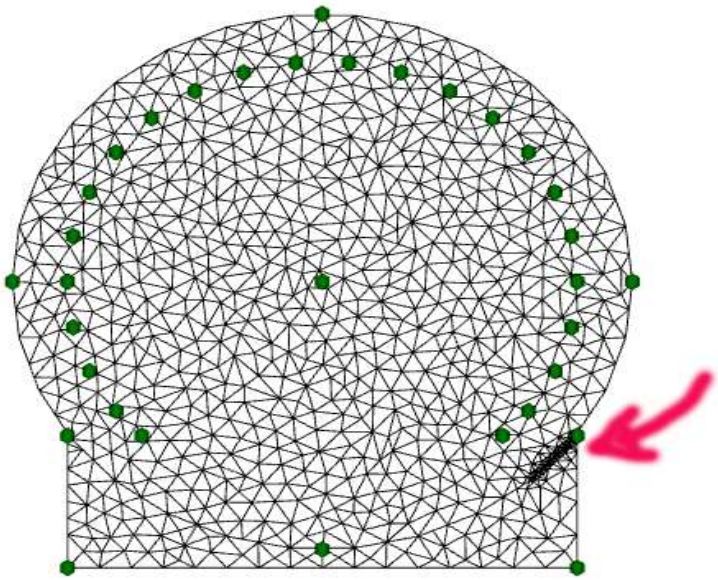
When constructing models, you should still take care to align the ends of beams and edges of areas (foundations, slabs, walls). If you are modeling angles or curved geometry, you need to avoid very small **overlaps** or **gaps**. The more you add to the model, such as line elements or common boundaries, the more **constraint points** are required to generate a valid mesh. We recommend that you inspect your FEA meshes to look for problem areas. Problems might be a huge number of elements, which can cause performance issues. Or you might have gaps between nodes and model objects, which could lead to round-off errors. In some extreme cases, the mesher will simply give up and fail to mesh your boundary. (Usually moving a vertex or two can solve this issue.) We have seen meshing issues in very large areas that also have very short sides or edges, such as curved boundaries aproximated with short straight chords.

Constraint Points

There are a number of places where a mesh is "constrained", which means that nodes must fall in certain specific places. This happens along member elements, grade beams, walls or similar. It also happens along shared boundaries between two separate areas. Sometimes the constraint is a single-point, perhaps the intersection of a member that passes through the mesh perpendicularly.

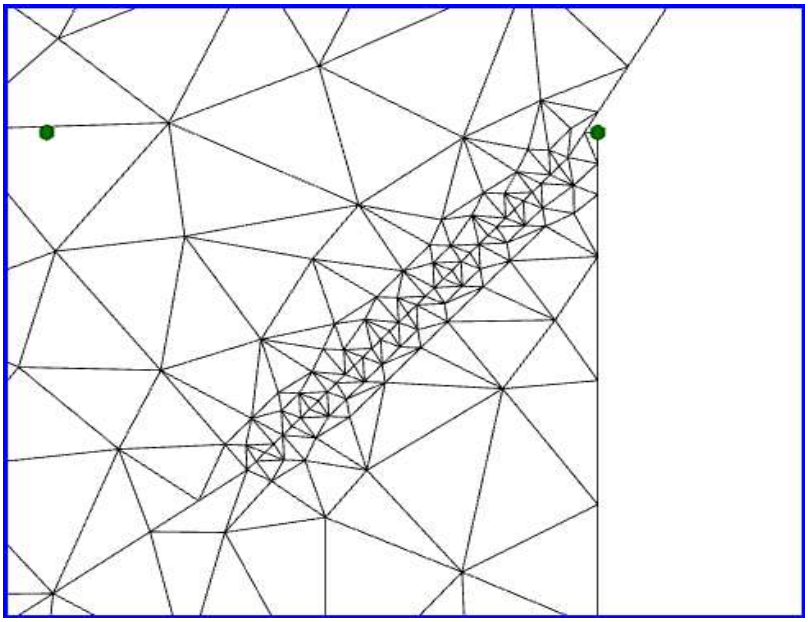
An Example Mesh Problem

Here is an example from a VisualFoundation project, where the mesher has done something that you may not want. There is a line where many very small elements were created. The **Filter** tab allows you to display the **Meshed Plates**:



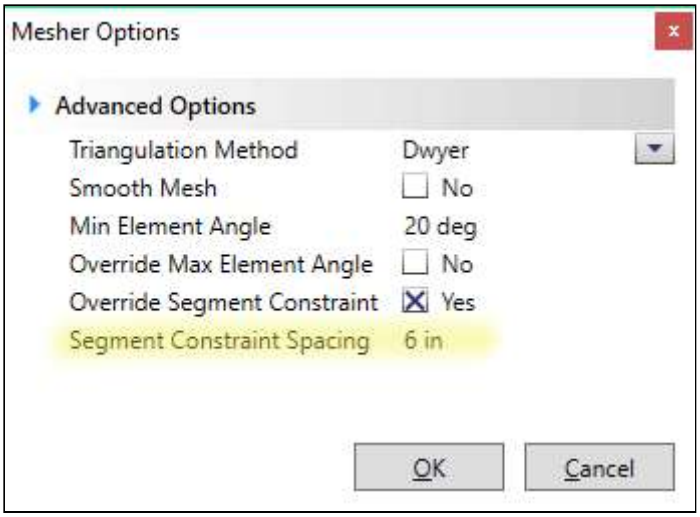
A Very Dense Region

There is nothing inherently wrong with this mesh, but it may have performance implications for your specific project. Generally, more plates are better, especially in regions of high-stress gradients, but you also want to find a balance between performance and accuracy. This could be an issue due to misaligned components of your model, but it could be the mesher is using an average edge length to determine an element size or node spacing.

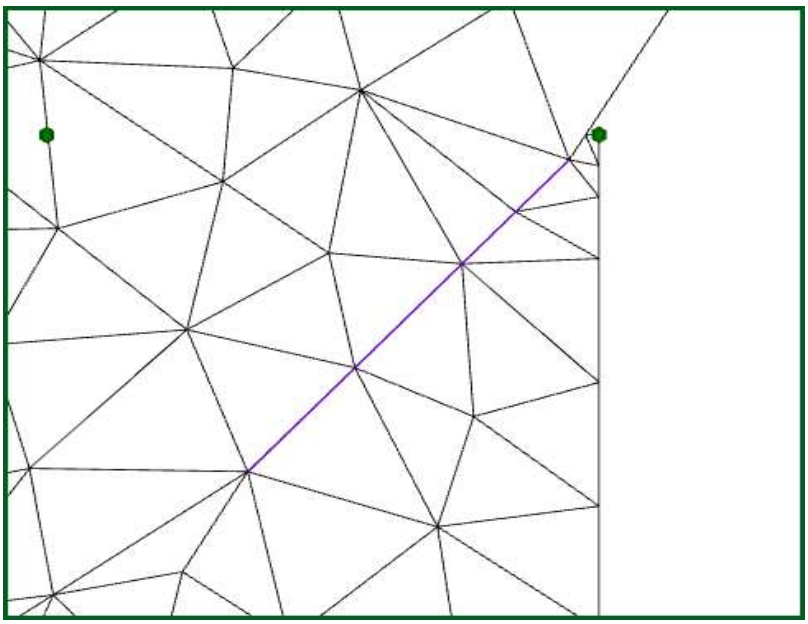


One Possible Mesh Solution

To address this issue, you can use the **Project Settings, Mesh Options** to give the meshing algorithm a hint. You will notice that there are half a dozen possible changes you can make to the mesher. You could experiment with your project to see how each affects the final mesh. In this case we want to increase the minimum length of plates along this line segment to something like 6 inches.



After making the change, the meshing is redone with a more expected distribution of plates in the region of this line.



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Computer Performance

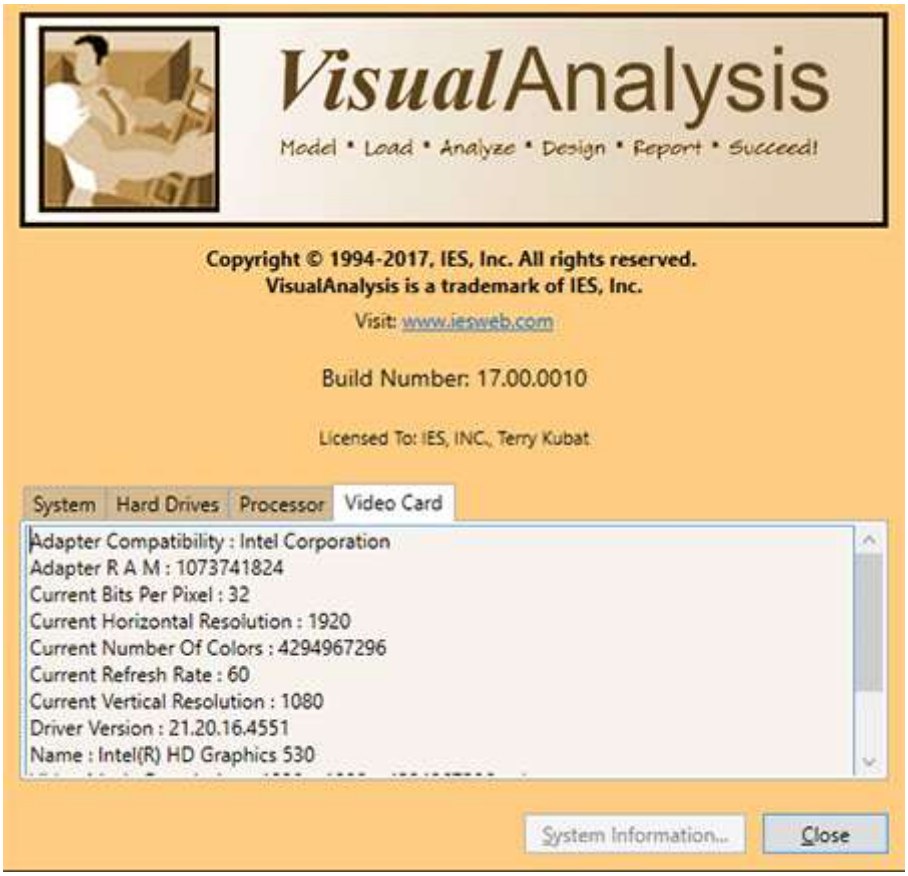
See How Your Machine Stacks Up

Performance Testing

As software developers, we tend to have machines that are better than yours. Well, at least most of you. We know that we have some customers who have recently upgraded or who always need the best of the best. Many of you will be using a laptop which, almost by definition, will be a step or two below the best available CPU or video card performance that is available. When we test our products, we do try to stress-test them with very large models that are not common for typical engineers or day to day operations. If our products can manage those, even slower machines should do OK with normal-sized models.

Know Your Machine

To find out about your hardware, you can use a number of different approaches. But we have made it easy for you. In VisualAnalysis, VisualFoundation, or ShapeBuilder, go to the **About box** in the software and click the **System Information** button.



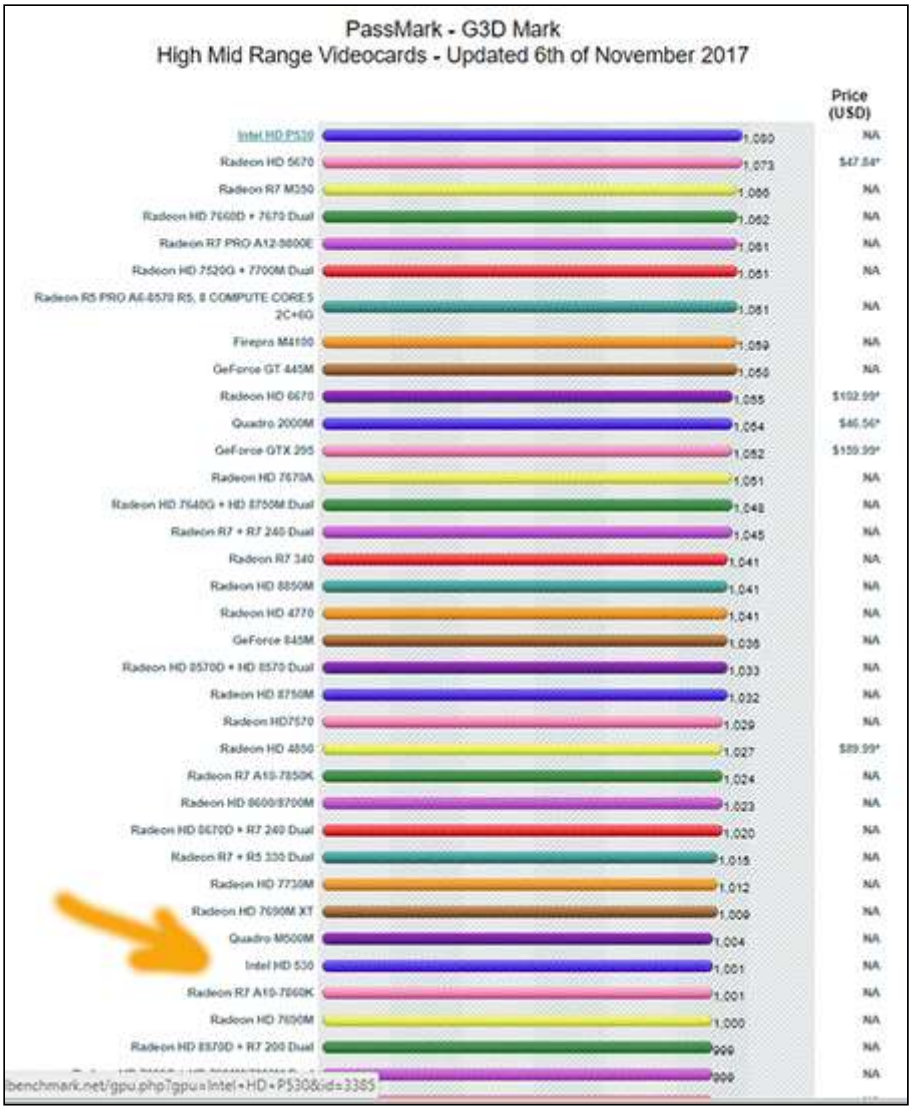
Rate Your Machine

If you are having performance problems, or if you are like most engineers and want some data to process, we would encourage you to check out cpubenchmark.net, where you can see how your **CPU** or your **video card** stacks up against others that are (or have been) available in recent years. Every once in a while we talk to customers who are having unusually slow performance for graphics or reporting and it could be that you simply have a very old or slow system.

You can eliminate the hardware cause if you find yourself in the top 75% of machines available. **Get suspicious** if your hardware is no longer listed. The quickest way to find your hardware in the list is to use **Ctrl+F** to do a browser window page-search of the chart for some key number in your CPU or GPU.

Our only Video Card recommendation is that you **avoid** the NVIDIA **Quadro** models, as we have seen "issues" with these models that we do not see with any other cards from any of the manufacturers.

Below you'll find Terry's video card (Intel HD 530) near the bottom of the mid-range GPU chart, and this video card does just fine with IES products. Notice that the performance does not drop off much for these mid-range cards at a G3D Mark of about 1000, while high-end cards have marks up above 13,000! You might also notice that new, great performance, video cards can be had for cheap! For example, a GeForce GTX 1060 has a G3D Mark of over 8000 for about $260.



If you want a more detailed, and perhaps automated comparison rating of your machine, you could download and run the free-trial PassMark performance benchmarking tool, which is put out by the same people that do the benchmark charts.

Software Slow-Downs

You might also have performance issues due to software bloat. We have written here in the past about tools to help you clean out your system or control what products are running in the background. Simple things like periodically emptying your Windows TEMP folder can improve the behavior of your system. More likely you have a number of startup or service-type applications that are running and consuming memory or CPU cycles. Some of us have resorted to re-installing Windows every year or so to clean out and start over. Using a newer version of Windows could help too, as older versions were optimized for older hardware!

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Product News

New and Improved Tools

Change is Good

Every once in a while we need to make some bigger changes to solve some problem. Earlier this year we released a very major overhaul of VisualAnalysis, the first such

overhaul since 2007, or 2010, depending on what you consider major. This has been overwhelmingly successful, even if we have knocked a few apples off the cart.

Our goal is to both simplify and clarify, to make faster and more reliable tools, and to provide capabilities that meet the needs of most engineers.

ConcreteBending 4.0

Last month we introduced a "new" product, which is really a spin-off from our misnamed, misunderstood VisualPlate product. ConcreteBending might have been called Concrete**Slab**, but we see it as more than that, at least in the future. By dedicating it to a narrow set of tasks, the tool is able to provide more specialized features and assistance to streamline your work. It overlaps with VisualAnalysis, so if you have that, you may not need it. Either way, ConcreteBending offers a fast, targeted approach to concrete bending problems for elevated slabs, slab and beam floor systems, or tank walls.

VisualFoundation 8.0

This popular tool recently got a fairly light makeover to keep it current, fast, and stable. Longtime users will notice performance improvements as well as a more detailed and capable design of grade beams, improved meshing, export to VA 17.0 format, and some other niceties.

VisualPlate 4.0

We are working on an upgrade to VisualPlate 4.0 to make it into an analysis-only plate bending solver. (Customers with licenses of VisualPlate may wish to convert their license to ConcreteBending, we will have more information about this once VisualPlate 4.0 is released. We expect to have a beta test ready in the next month.)

ConcreteSection

We are working on a new tool that focuses on reinforced **ConcreteSection** analysis. We currently have a feature in ShapeBuilder to this effect, but it is fairly limited. We are going to split that out into its own tool with some very nice improvements. ConcreteSection will offer stress analysis, cracked properties, and interaction diagrams. You will be able to embed steel shapes into the cross section or have holes. Watch for a beta test release of this product in the next month.

More to Come...

We are in the planning stages for upgrades to VisualAnalysis and ShapeBuilder as well. If you have specific suggestions or complaints about these products, NOW is the time to submit them so that we will consider them as we move forward.

VisualAnalysis always has a very long list of ideas for potential changes. We expect the next upgrade will be primarily design-code updates and a collection of minor revisions to correct some deficiencies that did not get properly addressed during the very major rewrite last time.

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News Tidbits

Miscellaneous Things

Upgrades

When we release a new major-version of a product such as the new VisualFoundation 8.0, you can safely uninstall the old version and start using the new version. If you are in the middle of a tight deadline project, you might wait until you finish that before

upgrading. We allow you to keep old versions installed and use them side by side, but usually there is no good reason to do this!

Dead Product-Versions

We keep old product versions around for downloads and licensing services for about 4 years after they are replaced by newer versions. After this month, **ShapeBuilder 6.0 will be a dead product** without any download file or licensing support.

You can continue to use dead products, as necessary, but you will need to have a copy of the setup files and any licensing tools and codes to use them. Of course, IES recommends using only the latest tools we have available for the best experience, the greatest reliability and correctness, and technical support services. You will not be able to activate new computers with dead products.

Customer Training

Once again we are hosting a live **classroom training** in Bozeman, MT in January. We love winter! Come to Bozeman to find out why. Or not. You can go from the airport to the hotel in complete comfort. Either way, we can give you a more in-depth look at how our products work and what you can accomplish with them. You will have the opportunity to ask questions, interact with other IES customers and spend some one-on-one time with IES engineers/developers. Registration is now open for the January 18-19, 2018 session.

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ShapeBuilder Survey Results

What You Said, Plus Follow-Up Questions

What We Learned

We have collected survey answers regarding the future of ShapeBuilder recently and would like to thank 100 customers for your participation. That means that a very large number of customers have not given us any direction. If you have not yet completed the ShapeBuilder customer survey, please do it today.

You told us that:

- Printed reports should be more flexible and of higher quality
- DXF import should be improved
- DWG file import should be added
- Make it easier and more flexible for exporting data
- Make it easier to manage your custom shape database

Composite Shape Questions Remain

A large percentage of you want us to do a better job with "composite stress analysis". Which is really too broad and general. We did not ask the right question, maybe. **What exactly are you looking for?** Please send us an example shape or two (in .sbf or a sketch) along with what specifically you want to learn about that shape or its behavior. We want to know more about what materials you are using, how the shapes are constructed, and what kinds of answers you need from ShapeBuilder. You may send this information to support@iesweb.com. Please help us provide the correct solution to your problems!

Please Clarify Your Answers!

Also, you may have made a suggestion or complaint, using a description that was very terse! If you really want us to understand one of the following, you might explain it in a support email, with images, sample reports, or more specific suggestions:

"More control over editing shapes" *(We offer 14 methods, **what are you missing?**)*

"Calculate all shape properties" *(What **specific properties** are you seeking?)*

"Templates for different types of sections" (Such as?)

Technical Support

We would like to remind people, however, that surveys are not the place to ask us questions or get problem resolution.

If you have a **specific issue or problem**, you should email that to support@iesweb.com, where we will respond, often within an hour or so, but definitely within a day. If you are not getting any reply, then there could be a communication issue and you might email Sales to resolve that!

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Right Brain Madness

How Terry Tries to Use His

Engineers are Left Brained

All day long we engineers are solving problems, doing math, science, and the other left-brained organized and logical tasks related to engineering. We love this. We also make schedules and measure gas mileage and follow sport statistics and debate politics using our rational reasoning abilities.

And yet we all have that other analog side of our brain, where intuition and creativity lingers even if it lies dormant or does not get much of a chance. As I have gotten older and perhaps because my analytical skills have gotten softer or less relevant, I have been spending time playing on the right side of my brain.

I have always had a role in marketing at IES because we are a fairly small company, but in the past year that role has become more primary. But even marketing an engineering software company can be a rather left-brained set of problems to solve: technical hurdles with web sites and emails, framing product descriptions in ways that engineers will understand and relate to them, and managing the production details of software development.

Art History

I've been trying to teach myself painting and drawing in the last few years. Both of my grandfathers painted a little and I always liked it as a student. My mother was a schoolteacher, so I grew up helping her with arts and craft projects for her classrooms or for our house. This included things like waxing leaves in the fall or decorating the

house with paper snowflakes. At one point (this was the 1970's) we were making our own candles with saved or purchased paraffin, old crayons, sand molds and other natural objects like seashells or birch bark. We also made terrariums, string art, papier-mâché piñatas, and the like.

Currently, I like the simplicity of markers, the playful nature of watercolor, and the mixing and corrective capabilities of acrylic paint. I have not tried oil painting yet--you gotta crawl before you can walk, right?

Mural Mural on the Wall

Recently, I have taken a slightly crazier approach by turning my walls into art experiments. I painted a tree in a stairwell, a landscape on my garage wall, and tried to capture fall colors with real leaves and spray paint in my office. The process is rewarding, even if the final work is lacking. There is always the option of a fresh coat of paint when it gets old. By the way, spray painting indoors is not the greatest idea that I've had, very toxic, and rather messy.

This kind of art may appear daunting to you, but I did the tree over a weekend, and the leaves in half a day. The garage took longer, maybe 50 hours, because I kept messing up the colors and proportions, and it is also a much larger surface.

Are You in Your Right Brain?

I have other right-brained activities as well that I am not going to foist upon you **at this time**, such as bad poetry, crude watercolor painting, or marginal photography. I am sure that some IES customers are doing fairly amazing and interesting right-brained work (or play). I would love to hear about how you balance your world with creative, intuitive activities. Send me an email (terryk@iesweb.com), or find me at Facebook, Instagram (@tekubat), or LinkedIn, to share your creative side. I'm just curious!