



Validate Your Results

Success with Finite Element Analysis

Using Finite Element Analysis

Many structural engineers get through school without specific FEA coursework or instruction. Even if you do get some, it is often of a theoretical or low-level programming mechanics approach. While it is good to have a basic understanding of the theory and limitations of this method, used in [VisualAnalysis](#), [VisualFoundation](#), our other 'Visual' products as well as [ShapeBuilder](#), some practical tips for correct application are usually all you need. One critical skill you need, is to know how to verify that you have good analysis results.

Before You Analyze

Before you perform an analysis, you should carefully check all your input data. Computer software only does what you **tell** it to do, not what you **want** it to do!

VisualAnalysis offers the **Tools | Model Check** command to look for the most obvious issues or problems. You still want to manually verify end-releases and support conditions are correct. Our products offer **Graphics** so you can visually observe member or plate sizes, materials, orientations, and locations to ensure things are as you expect.

Reports are available to record the data you have entered and provide another way to find mistakes.

Total Load Checks

One of the first checks that should be made after an analysis is to verify your total structural loading. In VisualAnalysis, the **Result** tab of **Project Manager** to see the Statics Check for each load case. The applied loads are totaled in each direction. Verify that the reported totals are in the ballpark with your estimates. If there is a discrepancy, verify load directions, magnitudes and combinations.

| Statics Check | |
|---------------|----------|
| Direction | Y Forces |
| Applied | -64 K |
| Reactions | 64 K |
| Balance | 0 K |
| % Error | 0 |
| Self Weight | |
| Y Weight | -26 K |
| X Center | 29 ft |
| Y Center | 22 ft |
| Z Center | 9.6 ft |

Results: Statics Balance

A Statics Checks will help you find many types of problems and has helped IES find bugs in our products. Essentially this is just a check that **the load total equals the total reaction** (in each global direction and rotation).

Check for nearly unstable structures. If you have poor geometry or very flexible members in critical areas, the structure can be on the verge of collapse due to instability. Many times unbalanced reactions can be a tip-off for these problems. This imbalance is automatically checked at the end of the analysis phase. You will receive a warning message if the Statics Check imbalance is significant--but our heuristic warning levels may not work for every project!

Statics Check Information

| Result Case Name | Status | Balance DX K | Balance DY K | Balance DZ K | Balance RX K-ft | Balance RY K-ft | Balance RZ K-ft |
|------------------------|--------|-----------------|-----------------|-----------------|--------------------|--------------------|--------------------|
| D+.6W **X Second Order | OK | 0.0 | 0.0 | 0.0 | -2.4 | 13.9 | 0.3 |

Not every imbalance is an error that needs fixing, you will need to use judgment. Some imbalances indicate you may need to run a 2nd-order analysis. Moment-balance is highly sensitive to the point of summation, and therefore not as reliable an indicator. Generally, though, a non-trivial force imbalance means you need a stronger or stiffer structure to carry the loads.

Reasonable Displacements

Look at the deformed shape of your model. Does it make sense based on the loading? Remember that the displaced shape is usually exaggerated so you can see it.

Look at the magnitude of the largest displacement. Is it large or unreasonable? If displacements are too large, the FEA **small displacement theory** is violated and results must be questioned.

Reasonable Stresses

When you are comfortable with the loads, statics, and displacements you should also check stresses. Are the stresses reasonable? The software might blindly place 1,000,000 ksi on a wood member without warning! Would you? It only takes a second to zoom in on the extreme color and see where it exists. Make a decision as to whether or not it is reasonable.

Validation Summary

Finally, use your experience and engineering judgment. If something just does not look right, investigate it carefully. Convince yourself that the analysis results are good before continuing on to perform design checks.

Getting correct results is up to you. We make every effort to test the software but it is impossible to prove it correct under all circumstances. You can also compare the results with another program, hand calculations, or estimates.

Defects Do Happen

If you do find an error in the software, we want to know about it! Carefully document the problem and then contact us. IES is committed to maintaining high quality tools. We stand behind the software and will work quickly to solve any problems you might expose.

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YouTube Channel

[YouTube.com/ieswebdotcom](https://www.youtube.com/ieswebdotcom) for all Videos

Free Demonstrations

IES has created over 100 short videos to demonstrate products, their specific features or to provide customer training in the use of our products. These videos are sometimes accessible from the web site, such as the demonstration video on product pages like

www.iesweb.com/va or www.iesweb.com/sb

Product Features or Training

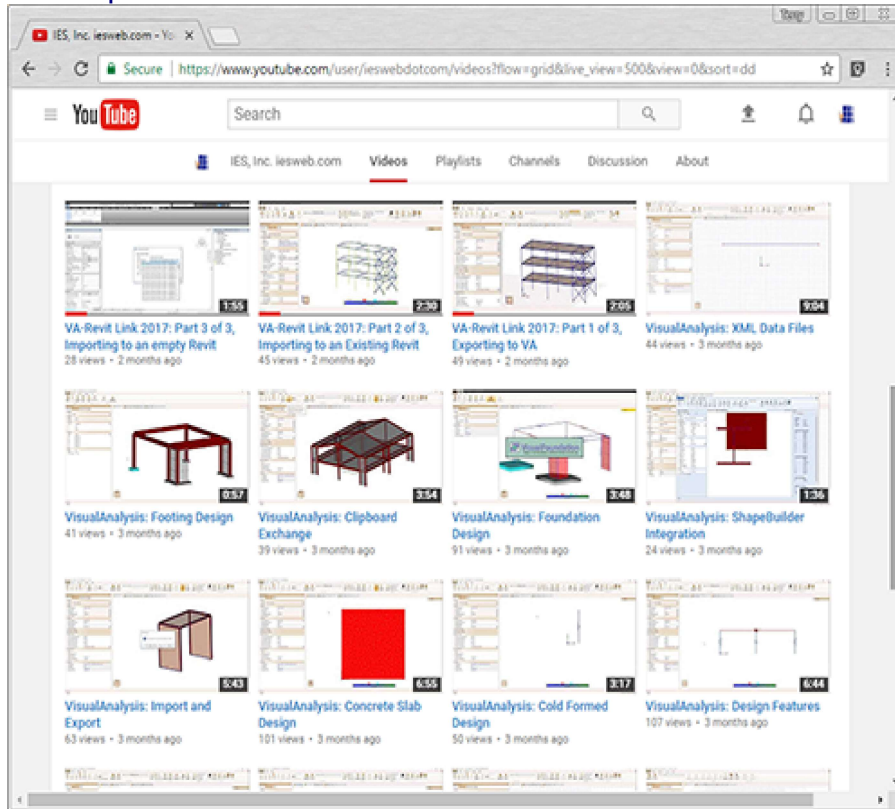
A few products have feature training-videos online on the 'training' or 'feature' tabs, such as for VisualFoundation and ShapeBuilder:

www.iesweb.com/products/visualfoundation/training.htm

www.iesweb.com/products/shapebuilder/features.htm

Videos in VA Help

With VisualAnalysis, because of the versatile and complex nature of the product, there are over 60 videos available. About 40 of these are built-in to the [Help](#), appearing in the Table of Contents, or if you search for a specific topic. The rest of the videos have been recorded from previous webinars or sent out via the recent 'Feature Friday' email



to customers.

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But if you want one-stop access to all the IES videos, for any product, in a way that is searchable and organized, then you should head directly to YouTube. Our channel name is ieswebdotcom. Here you will find playlists and an option to 'subscribe'. When you subscribe you can get notified when new content appears. Plus it helps IES to become more visible, which leads to more sales, better R&D and eventually better products for you. So go ahead, [subscribe](#) to the IES YouTube channel today.

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The CFS and VisualAnalysis

The Partnership with RSG Software

RSG and IES

In 1999 IES, Inc. and RSG Software entered into a partnership agreement to provide RSG's CFS design-checks through IES VisualAnalysis. This arrangement has served the

engineering community very well now for 18 years. IES customers get access to best-in-class expertise from [RSG Software's Bob Glauz](#) as well as the ability to model entire frames and trusses with multiple materials in one project. Customers have used this for structures like greenhouses, canopies, roof systems, and much more.

Cold-Formed Steel Design

This is handled for VisualAnalysis customers all behind the scenes, without any need to purchase the CFS product directly. A portion of your VisualAnalysis purchase goes directly to RSG Software for providing this service.



CFS + VisualAnalysis Benefits

The RSG connection also allows any **custom shapes** that are created through the CFS product to be used in your VisualAnalysis model. In order to accomplish this you would need to purchase a copy of CFS, create your shape library through that product, and then use **File | Import | Import Cold Formed Library** directly in VisualAnalysis. (In the past, and still optional today, you used ShapeBuilder for this task.)



CFS 10.0 Technology

RSG recently introduced CFS 10.0, which is created using the same modern technology as VisualAnalysis 17.0. This has allowed a much cleaner, faster and fully 64-bit implementation of the design-checking process, as well as better reporting of the calculation details. The new CFS implements the latest 2016 AISI/NAS specification and also supports older specifications with Canadian and Mexican provisions.

Get Accurate with VisualAnalysis

When comparing structural software products, it is important to pay attention to details. In the case of cold-formed steel design, our RSG partnership speaks volumes about our quality, accuracy and commitment to our customers who use light gauge steel in their projects.

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Survey Time!

We Beg, We Plead

We Need Your Help

Our products are only good if they meet your needs. They only get better when people tell us what is broken, difficult, confusing, or missing. So, **we beg you for feedback** all the time, any time. But today we have one or two very specific surveys for you to quickly (and anonymously) tell us what you REALLY THINK.



VisualPlate Customers

If you license VisualPlate we want to know: Do you use this tool? How do you use this tool? A few very quick questions to guide our future paths. Please take the [VP Customer Survey](#).

VisualAnalysis Customers

VisualAnalysis 17 introduced some major changes and some great new benefits. Whether you've been using VisualAnalysis for years or just a couple of weeks, we want to know what your "First Impressions" are, now that you've had opportunity to use it for a while. You can complete the [VA First Impression survey](#) in less than 5 minutes and it will help us to improve your experience with the next major upgrade.

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