# *Virtual* **Work**

Contents

Masonry Design²

Innovative Tool is Now Customer Driven!

When the engineers at IES produce a version 1.0 product, it is often somewhat of a guess. That is, we work hard to implement a tool that *we think* is what our customers will want. So while QuickMasonry 1.0 was a very exciting piece of software that met with an enthusiastic response, it left some customers craving more features. Version 2.0, with its dramatic improvements, will change that! IES engineers have made a great effort to listen to customers for the past year, making lists of features requested, complaints made, and implementing the latest MSJC code provisions to produce a design tool that is unmatched in the industry, and now customer-driven.

Yes, QuickMasonry 2.0 will likely meet your needs for **clay masonry** or **CMU** design tasks that you will face everyday--because hundreds of your peers have used the tool and told us what was missing. IES has now released the results of this yearlong partnership with customers and it is time for you to reap the rewards.
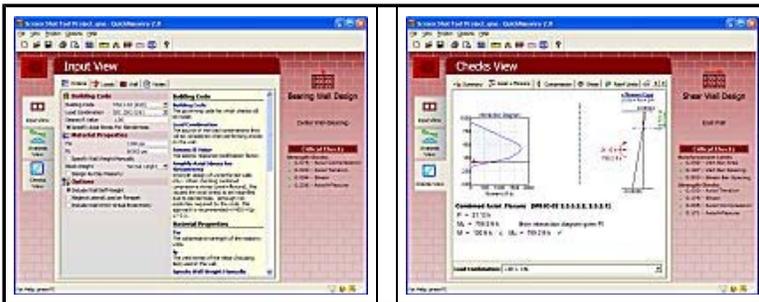
Free Upgrade from Version 1.0!

If you have been using QuickMasonry 1.0, then you should promptly uninstall that product, go to the Updates page on the web site and install version 2.0. It will work "out of the box" for you with your same license key. No cost, no hassles, just a free upgrade!

Get More Information or a Free-Trial

If you have not been using QuickMasonry 2.0, now is the time to take a second look. As with all the IES Quick* products, this one offers tremendous features including the fantastic Transparent Reporting™ that gets you out of the black-box and into fully verifiable 21st Century structural engineering. Nothing is left to chance as you, your checkers, and your local building officials will be able to see exactly what checks were made by the software.

Check the web site for screen shots, sample reports, a comprehensive feature list, and then download the free-trial. Solve your next problem in minutes, with QuickMasonry 2.0.

[Back to Top]

Custom Wood Shapes: SB4 to VA5.5

A Tutorial for wood shape design in VisualAnalysis!

Exporting a shape from ShapeBuilder to the Shape Database for use in VisualAnalysis 5.5 was supposed to be trivial. Thankfully, for steel shapes it is very easy. For wood shapes it is almost as easy but there is an additional step that is difficult to find in the documentation. This tutorial provides the missing link!

Unfortunately, ShapeBuilder 4.0 cannot be used to export cold-formed steel shapes **that can be designed** using VisualDesign, for that you need the **CFS** tool from www.rsgsoftware.com and the IES Shape Database Editor. You can create custom cold-formed shapes in ShapeBuilder to get properties, even effective properties, as well as export them for *analysis* in VisualAnalysis, just not *design* checks.

Quality Assurance

Verification & Validation

Beware of software validation claims! Occasionally, we get requests for a "Validation Suite" or "Verification Projects" for IES software. This is something that we currently do not make available for any of our products.

Here is a bit of software engineering philosophy that can have a big impact on your work, and your career, so please do not brush off this little article as a waste of time!

Assurances from IES, Inc.

Before we digress into deep software theory, we would like to assure you that IES definitely performs internal testing of our software to help ensure that it is accurate with respect to the theory and practice of civil/structural engineering for which the software is primarily intended.

However, we do not publish validation information or documentation for a couple reasons:

- It could be misleading
- Customer validation is more important

A Validation Suite is Misleading?

A Validation Suite could be misleading, as you simply cannot 'prove' a software correct by any number of test cases. A fair number of our less-sophisticated customers could misinterpret validation information to mean they can put blind trust in the

For wood shapes, it is not enough to export from ShapeBuilder 4.0, you also need to mess around in the Shape Database Editor to get shapes that can be designed in VisualDesign. In this tutorial, we would like to explain how it is done, as we have had a number of technical support questions on the subject.

The Process

There are four steps involved in getting a custom wood shape from ShapeBuilder into the database so that it can be used for design. If you only need analysis capabilities, then you can skip step 2 in the process, and step 4 will not apply.
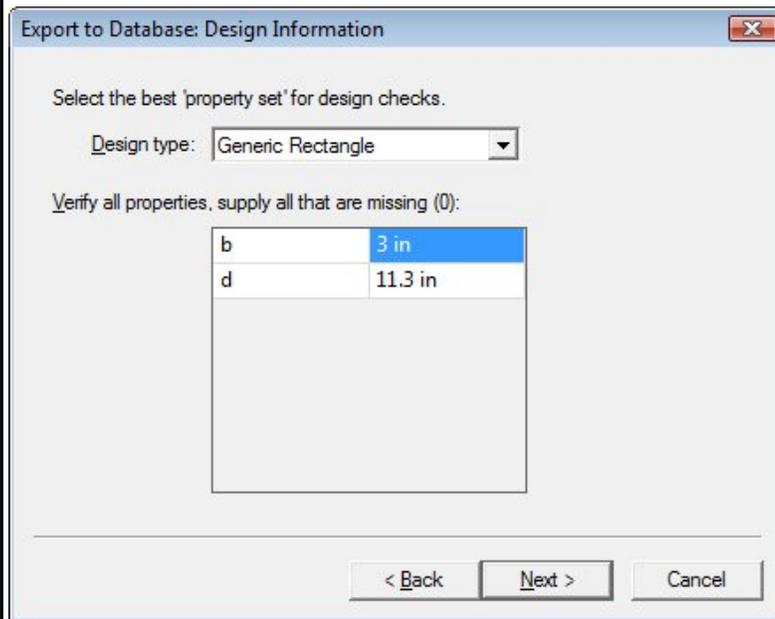
1. Create a custom wood shape in ShapeBuilder and export it.
2. Set up the appropriate "property sets" using the Shape Database Editor.
3. Create a model in VisualAnalysis using your custom shape.
4. Set up Design Groups and get unity checks in VisualDesign.

Here then are these steps in a bit more detail, with some background explanations. You will find additional details about the process and function of the database in the help files that are included with the products mentioned, especially in the Shape Database Editor.

For the purposes of this tutorial, we will assume that our shape is a doubled SS2x12.

Step 1: Create and Export the Shape

You can export a wood shape, which is a single "piece" from ShapeBuilder to the database using the **File | Export to Database** command. It helps to do an **Advanced Analysis** first, so that you get an accurate value for the torsion constant, J. In the Export Wizard, be sure to check the box for Design checks, and then select "Generic Rectangle" in the next page:

Export to Database: Design Information

Select the best 'property set' for design checks.

Design type: Generic Rectangle ▼

Verify all properties, supply all that are missing (0):

| b | 3 in |
| d | 11.3 in |

< Back   Next >   Cancel

For steel shapes, this would be enough (you would select the best steel-design property set here), you would be done and you could use the shape in VisualDesign. Unfortunately, wood shapes require that TWO property sets be defined, and the export wizard only allows you to set up one of them. So while we have defined the actual b and d dimensions (Generic Rectangle), the design software also needs the nominal b and d values (Dimension Sawn Wood property set). So we must use the Shape Database Editor to complete this process, which we will do in step 2.

Before that however, we need to decide WHERE in the database to place our shape. Again, wood design is a bit fickle, and we MUST use the existing wood shape categories in the database to ensure our shape will be usable. For a doubled SS2x12 we will use the same category for the existing SS2x12 shapes: "NDS Wood\Dim. Lumber (Std. Dressed)". So on the next page of the export wizard we select this category and provide a reasonable name for the custom shape: "2x_SS2x12":

software.

While there is much that can, and indeed is done to test and validate IES software it is both practically and theoretically impossible to completely test any non-trivial software product for 100% accuracy and reliability.

In summary, you cannot test all 'paths' through the code or all possible combinations of input. There are issues with numerical calculations (round-off, overflow, etc.) and there are 'environmental' issues relating to code libraries, external devices, operating systems, etc. For more details about the impossibility of complete testing, please visit our FAQ Answers and search for validation.

Customer Validation Required

It is important for each customer to do 'validation testing' themselves, both to understand the capabilities and limitations of the software and to validate with projects that are typical of the kind of work they do.

Our recommendation is that your company create some validation tests to compare with other tools or hand calculations that you can run periodically on the software to ensure that it is working properly.

Each project should be verified through engineering judgment, spot-checking, hand calculations, or other means of verifying and checking the input and output from the software.
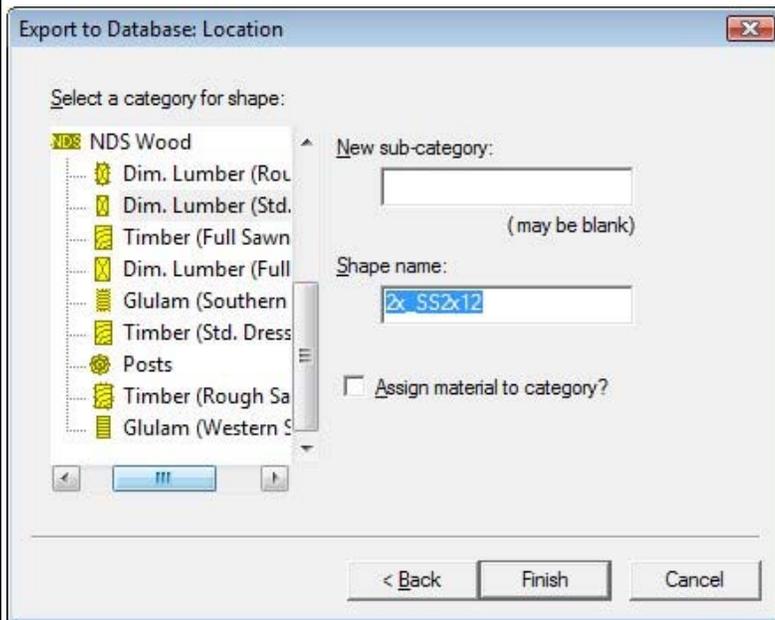
Software is not to be trusted blindly--lives are at stake! The old mainframe adage "*Garbage In, Garbage Out*" still applies today, yet it is just one potential pit on the road to successful software use.

An Update on VA6

VisualAnalysis 6 Timeline

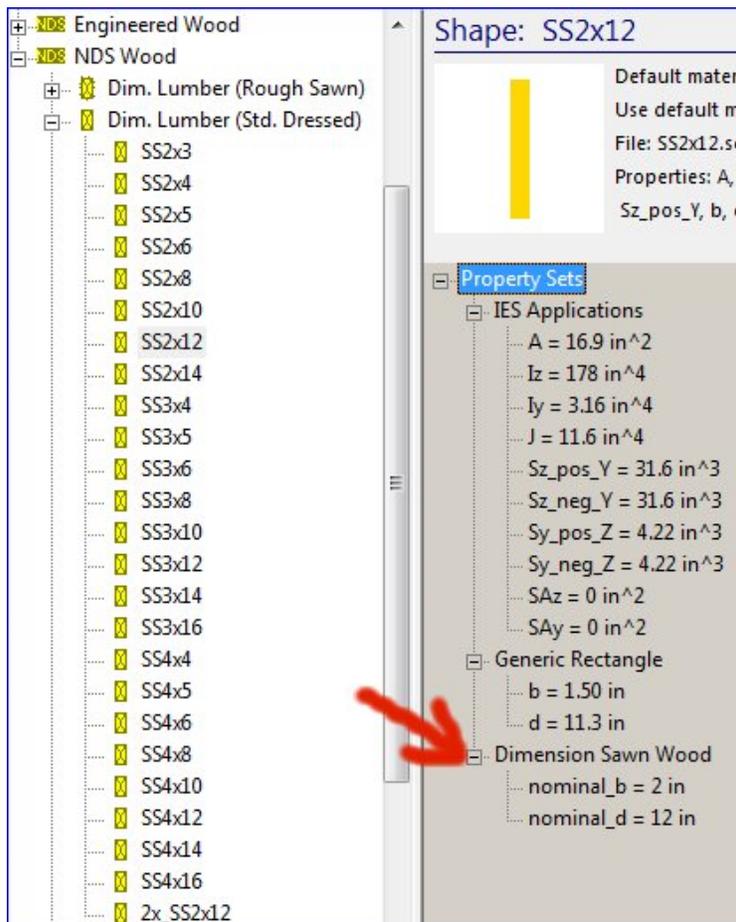Okay, we are a little behind schedule on VisualAnalysis 6.0, which was supposed to enter testing in December. We are

Export to Database: Location

Select a category for shape:

- NDS Wood
  - Dim. Lumber (Rou
  - Dim. Lumber (Std.
  - Timber (Full Sawn
  - Dim. Lumber (Full
  - Glulam (Southern
  - Timber (Std. Dress
  - Posts
  - Timber (Rough Sa
  - Glulam (Western S

New sub-category:

(may be blank)

Shape name:

2x_SS2x12

☐ Assign material to category?

[< Back] [Finish] [Cancel]

Step 2: Run the Shape Database Editor.

Now the shape is in the database, but it is still missing a bit of information that the design software needs. You can run the Shape Database Editor (**Start | All Programs | IES | Shape Database Editor**) to supply the missing information quite easily.

After running the tool, you may be prompted to select the database to use, select the 'new' database system. Locate your custom shape in the tree and notice the "Property Sets" shown to the right. Select an existing shape (like the original SS2x12) and notice that it displays the additional Dimension Sawn Wood properties:

- Engineered Wood
- NDS Wood
  - Dim. Lumber (Rough Sawn)
  - Dim. Lumber (Std. Dressed)
    - SS2x3
    - SS2x4
    - SS2x5
    - SS2x6
    - SS2x8
    - SS2x10
    - SS2x12
    - SS2x14
    - SS3x4
    - SS3x5
    - SS3x6
    - SS3x8
    - SS3x10
    - SS3x12
    - SS3x14
    - SS3x16
    - SS4x4
    - SS4x5
    - SS4x6
    - SS4x8
    - SS4x10
    - SS4x12
    - SS4x14
    - SS4x16
    - 2x_SS2x12

Shape: SS2x12

Default materi
Use default ma
File: SS2x12.sc
Properties: A, I
Sz_pos_Y, b, d

- Property Sets
  - IES Applications
    - $A = 16.9$ in^2
    - $I_z = 178$ in^4
    - $I_y = 3.16$ in^4
    - $J = 11.6$ in^4
    - $S_{z\_pos\_Y} = 31.6$ in^3
    - $S_{z\_neg\_Y} = 31.6$ in^3
    - $S_{y\_pos\_Z} = 4.22$ in^3
    - $S_{y\_neg\_Z} = 4.22$ in^3
    - $SA_z = 0$ in^2
    - $SA_y = 0$ in^2
  - Generic Rectangle
    - $b = 1.50$ in
    - $d = 11.3$ in
  - Dimension Sawn Wood
    - $nominal\_b = 2$ in
    - $nominal\_d = 12$ in

To add the missing information, you simply right-click on your custom shape and select the

---

actively working on this major upgrade to VisualAnalysis and are currently focusing our efforts on improving the design software, which has required some architectural changes with significant ripple effects through the entire program.

Our goals have shifted a bit and we are not going to rush this product to market, but instead focusing on making it the best tool we can in a reasonable amount of time. That means that you might not see it completed in the 1st quarter of 2007.

Here is the proposed timeline (but without any specific dates!)

[1 Month] Continue internal development for at least another 30 days. Working on VisualDesign features, user interface "clean up" and primary documentation and testing.

[2 Weeks] Complete an Alpha Test version for a few key customers for some rapid feedback. Test this for 2 weeks to correct any major problems that are discovered.

[1 Month] Release a full-fledged Beta Test for all customers. Testing for 30 days with a "Cash for Bugs" program as incentive for participation.

We are very excited about VisualAnalysis 6 and we think you will be too, as soon as you can see it!

[Back to Top]

Don't Black Box It!

By Jeff Lutzenberger, Ph.D.
"Apathy is the glove into which evil slips its hand."

--Bodie Thoene

At Integrated Engineering Software, Inc. one of our defining goals is to produce transparent and error-free software for structural and civil engineers. Recently we have noticed an alarming trend in structural software to produce what can only be called "black box" solutions. That is, the engineer does as **little thinking** as possible and leaves the details to the software. While this

Add Support for Property Set command. Next you choose the Dimension Sawn Wood property set from the list, click OK and you will be allowed to provide the properties needed:

Enter Required Properties	
nominal_b	4 in
nominal_d	12 in

[OK]   [Cancel]
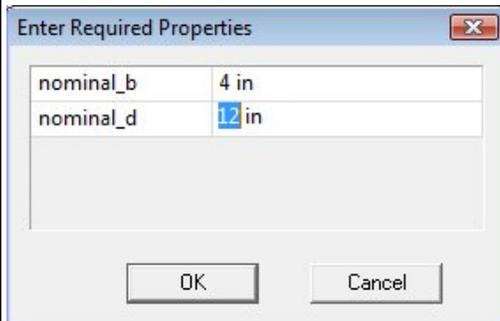
Now you can exit the Shape Database Editor (it should prompt to save the NDS Wood.dbs file).

Step 3: Build your VisualAnalysis Model

Now that you have the shape defined in the database, you can select it for a member in your model. There is no "trick" to this step, you select the shape just as you would any other from the database. For wood design, though, it is important that your wood material correctly "match" the wood shape, according to the rows in the following table:

Shape Property Set	Material Property Set
Dimension Sawn Wood	Visually Graded Dimension Wood or Mechanically Graded Wood
Timber Sawn Wood	Visually Graded Wood Timbers
Glulam Wood	Wood Bending Glulam or Wood Axial Glulam
Post Wood	Wood Poles
Structural Composite Lumber	Structural Composite Lumber

Please Note: If you had previously used a custom shape in VisualAnalysis and missed step 2 or got the properties wrong and you had saved that shape in a .VAP project, the new properties are not automatically pulled from the database. VisualAnalysis caches shape and material properties in the .VAP file so that your project file is portable to others who do not have your customized database, so you will need to re-select the shape from the database to obtain the updated properties.

Step 3: Set up Design Groups

Once you have analyzed your model and have reasonable analysis results, you can start designing. The first step is to set up a **Design Group** for wood design, in a **Design View**. You will create a "*Wood NDS 2001 ASD*" group, and then make sure to check the "**Design As**" shape and material in the **Project Manager Modify** tab showing the **Design Group** properties--they must match the categories used in the model.

You should then be able to see unity check values in the **Design View** for your member, be able to **Design the Group**, and also to *double-click* the member to see the design checks in a report.

Conclusions

This tutorial should provide you with the details you need to add custom wood shapes to your database. If you modify shape or material database files, or create new ones, be sure that you make backup copies so that you do not lose your customizations. The database files are located (by default) in "C:\Program Files\IES\IESCommonFiles\".

In the future, we hope to eliminate step 2 in this process, making it easier to create custom shapes in the database. We also hope to provide better support for doubled (and tripled, etc.) shapes for modeling in VisualAnalysis!

[Back to Top]

Don't Black Box It! (Continued from Column 2)

Conclusions

At IES these questions are always in our minds whenever we make a modification to any of our products. And whenever there is any doubt we err on the side of conservative. This is why the engineers at IES always appear well rested: we sleep soundly at night knowing that we are doing the right thing.

---

may seem like a great solution, we feel it is a dangerously cavalier position that deserves some attention.

So Easy a Child Could Do It

I assert that my thirteen year old son could model a multi-story structure in any one of the structural analysis programs on the market (including our own). He could probably interpret stress gradients if I told him that red was bad and green was good. And, if I showed him a few simple design commands he could even produce an, albeit fictitious, design for the structure. This would not, however, qualify him to design such a structure.

While none of us would seriously turn a thirteen year old loose on such an engineering problem (unless he was Doogie Howser) I think this example exposes **a dangerous trend** in structural software. As code requirements become more complex so too must our tools. However, in an attempt to shield customers from complexity (and thus gain a competitive edge), structural software companies have begun to hide much of the detail associated with the implementation of building codes. This can lead to **a false sense of security** that everything is being handled properly behind the scenes.

Validation is Required

As an engineer and a programmer I will tell you right now that no software company, regardless of its resources, can write software the will always handle all code requirements properly. Anyone who claims otherwise is either not an engineer or has misplaced his/her ethics.

We should constantly be asking ourselves these questions: "Can I validate my software and do I trust the people writing it?" The next time you're unsure about what your software is doing ask yourself these very questions.

<- Continued at left

We all like to consider ourselves ethical engineers, and I would say that those who use our software are some of the most ethical and conscientious engineers in our profession. However, in today's competitive economy it is all too easy to be swept up by marketing hype, time pressures, and financial restrictions. As engineers we are familiar with the expression "use the right tool for the right job." However, it is our interpretation of "the right tool" that must be examined. At IES we believe that our software is "right" because it is thorough, transparent and programmed by real engineers.

[Back to Top]