

Tips for Selecting Wood-Frame Structure Single-Member Sizing Software

By Ross Theilen, P.E.

When it comes to appropriately sizing wood beams, joists, and other structural framing members, engineers (unless they've developed their own tools) have two choices: use software developed by a third-party company or use software provided by a building product manufacturer. In some cases, engineers prefer third-party programs because of concerns that manufacturers' software may limit the range of materials they can specify. On the other hand, some engineers favor software from manufacturers due to the tools' more detailed performance specifications for their branded structural framing products.

Below are several factors to consider when evaluating general-purpose sizing tools and proprietary software developed by manufacturers, including some key features to look for in those tools.



Manufacturers' sizing software offers greater details on their specific products' capabilities than general purpose tools do.

Proprietary vs. General Purpose Tools

While a building product manufacturers' sizing software targets their own products, the tools don't necessarily restrict engineers from specifying equivalent materials, if desired. As such, advantages in cost savings, ease of use, and the ability to maximize framing member performance are among the reasons proprietary tools may fit a designer's needs better than general purpose tools.

One advantage of manufacturer-specific software is that it is often free. Companies anticipate that engineers will use the tools to specify their products, of course, but if the brand is trusted and often used, the benefits of synchronizing the software and framing materials can be substantial.

For example, using manufacturers' software often eliminates the need for engineers to recall usage guidelines specific to a brand's framing materials. The software will typically have the products' unique capabilities and limitations built in – including compliance with building codes. General purpose sizing tools are typically more generic. In addition, manufacturer-developed software is usually updated more frequently than general-purpose software to reflect changes in product lines. In many cases, general-purpose software packages leave it to the user to enter and maintain product properties or require additional fees for upgrades and relevant information.

Manufacturers' sizing software also offers greater levels of detail on their specific products than do general-purpose tools. For example, general-purpose sizing software will typically provide analysis results for

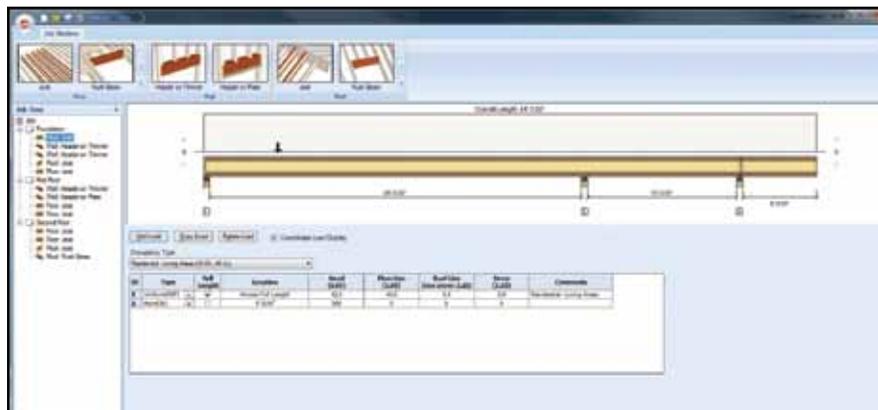
a generic material class such as laminated strand lumber (LSL) or laminated veneer lumber (LVL). But since performance capabilities of specific products vary by manufacturer, the tool may not maximize the design capabilities of a specific brand. For firms that plan to specify a given company's products, the generic tool may even underestimate the capabilities of the desired LSL or LVL brand.

Using a manufacturer's software can boost framing performance and thereby help ensure efficient material usage, and potentially reduce project costs if fewer members are needed. For example, holes in I-joist webs allow trades to run plumbing and HVAC without dropping the ceiling. I-joist cantilever reinforcement augments joist strength on loaded cantilevers allowing the builder to stick with a consistent joist series for an entire framing area and avoid upsizing select joists. These kinds of options depend significantly on methods developed by manufacturers and are therefore typically not found in general purpose sizing tools.

Range of Structural Products and Applications

When using manufacturers' software, engineers can limit the number of different single-member sizing tools needed by using software from companies that offer numerous types and sizes of wood products. Consider tools that can evaluate a full range of materials and member types, such as I-joists, LSL, LVL, and Parallel Strand Lumber (PSL) for headers, joists, beams, etc. Tools that guide the user in sorting out the best product for a given application can really help navigate the variety of product technologies available today.

In addition, look for a tool that fits the types of projects your firm typically designs, whether single-family homes, multi-family, or other light commercial construction. Tools that allow the user ultimate flexibility to model unique conditions often lack efficiencies attained from focused tools that provide support conditions typical in wood frame construction, common loading scenarios, etc.



Single-member sizing software with a graphic interface helps make design simple and intuitive.

Also important is a tool's ability to size members within the range of applications encountered in many modern wood-framed buildings, such as drop beams, sloped roofs, and cantilevers.

Capabilities Beyond Code Compliance

Some single-member sizing tools allow for evaluation of structural performance beyond code compliance. For example, the traditional approach to designing floors based on live load deflection criteria provides a sound structure that meets codes, but may fall short of the owner's desired comfort level or expectations if it bounces, feels soft, or vibrates when walked on.

To address this, sizing tools are available that can predict how occupants will perceive the floor based on specified materials and installation methods. Such tools provide a floor performance rating based on those specifications, enabling the engineer to quickly and easily alter products and specifications to balance anticipated performance with the available building project budget.

Ease-of-Use Features

As with other software, it is important to select single-member sizing tools that are intuitive. Software applications that utilize graphical

illustrations (e.g. pictures and layouts) can make member and connector selection simpler than applications that rely solely upon written descriptions. Some software also offers customizable interfaces that enable firms or individual users to alter the tool to their preferred way of working.

Other features to look for include the ability to rapidly evaluate alternative member sizes and types, and organize multiple member calculations in a single file. These attributes help speed design of a given project and enable transfer of key data to similar future projects.

Depending on the firm's needs, it is also important to consider other tools with which the single-member sizing software can integrate. For full-service design firms and for

coordinating with outside design professionals, tools that seamlessly tie-in with 3D modeling and architectural software can streamline the overall building design process and reduce time working on a project within or between firms.

Many sizing tools – whether for purchase or provided free of charge – are available for download from the Internet. Consult the third-party developer or framing product manufacturer's Web site for details. ■

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ERRATUM

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A discerning reader has noted that the photo in the lower right corner of page 24 of the article is the Wainwright Building, erected in 1890-91 as Missouri's first steel-framed building. Mr. Stuart (author) notes that this type of construction, along with other similar variations that co-existed during the same period, is described in the last paragraph of the Masonry section of the article. In addition, the photo on page 27 of the article is of the Reading Terminal, Philadelphia, not the 30th Street Station as noted. Mr. Stuart and STRUCTURE magazine regret any confusion arising from these errors.

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