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Editor's Message

Engineering the Whole House: Whose Job Will It Be? by Daniel Holland

Heads up! The way you do business could change. Dan Holland introduces this issue by considering an important trend in building design and how it could affect the component manufacturing industry.

I hope you are as excited as I am about an entire issue of SBC devoted to engineering advancements. If you aren't, you still need to read it because there are some very significant things happening in the marketplace that revolve around building design and building component design.

More often than not in the past, residential and small commercial wood frame buildings have not been designed by a licensed design professional. My company has built buildings from plans sketched on a napkin and most other component manufacturers have as well. Even though the plans we built from were not designed by a licensed professional, the building we built is structurally sound and was fully accepted by the local building inspection authority. The point being, most conventionally framed wood buildings are built by prescribed rules expressed in a building code. The building is not fully analyzed. Many such buildings use trusses. Trusses are an engineered product, but the use of trusses does not make the building engineered.

Many in the building design and structural engineering community want to reduce the use of prescriptive methods in wood frame building. The insurance community is also beginning to recognize the potential shortcomings of the prescriptive methods used in wood frame buildings and adding pressure to have all buildings fully analyzed and designed. The reasons for moving away from prescriptive methods to full building analysis are many, but the major reasons are related to design safety and cost effectiveness. Truss manufacturers have been promoting trusses for the very same reasons since the invention of the metal connector plate. This shift to full building design is not without difficulty, however.

The root of the difficulty is that the design work for full building design costs more than it does when prescriptive methods are used. Material savings and labor savings outweigh the increased design work costs, but pressure is still placed on the designer to do the design at the same cost as before.

This price pressure is being worked out in a variety of ways in different parts of the country. The primary solution is for the building designer to simply shift responsibility and design work to the component manufacturer and truss design engineer. If component manufacturers are not vigilant

and thoughtful they may end up accepting this added responsibility and risk without compensation. Some component manufacturers are choosing to disclaim the added design work at bid time, such as bracing design and truss-to-wall connection design. Others have chosen to provide directly or indirectly (e.g., through affiliated or aligned companies) full building design service, not only accepting the additional design work but competing with the building designer for all of the design dollars.

Another difficulty related to the move toward full building design of wood frame buildings is that the computer tools for analysis of the full building are not as advanced as the building designers would like them to be. Specifically, the building design community wants to have the truss design tools now used by the component manufacturer.

The building designer wants to be able to do the truss layout so that all of the truss connection locations and loads at those connections are known, allowing better analysis and design of the supporting structure. The building designer also wants to know that the trusses on his layout can be designed and that the component manufacturer won't be calling him saying his layout won't work because the trusses can't be designed. Sometimes, the building designer is forced to redesign the building structure to accommodate the new layout of the trusses. Designing the building twice is rarely cost effective. At times the building designer is able to recover this added cost from the owner and at other times the designer loses. Either way, one or the other is unhappy.

To make the pressure even greater for the component industry to provide truss design tools to the building design community, many builders envision the ability to use the same design without regard to any particular component manufacturer.

Another area where building design software is not as advanced as needed is in the area of bracing design. Quite frankly, not enough research has been done to define and test the methods and math that are needed for the computer to design the bracing for trusses to act as a system. Many building designers do not realize that trusses are not engineered to act together, but as individual structural elements dependant on bracing designed by others to keep them from bowing out of plane. Trusses are two-dimensional elements. Forces in the third dimension are the building designer's concern. Software is needed to design the bracing to create a three-dimensional system, accounting for the connection of the bracing to the supporting structure and clearly defining the loads applied to the structure by the bracing. WTCA is taking steps to make certain that this needed research will be undertaken in the near future.

So why hasn't the component industry given the building design market the truss design tools it clearly wants? There are several good reasons. The chief reason is that in doing so, the component manufacturer would lose almost all of the opportunity for competitive advantage over other component manufacturers. The component manufacturer would not be able to creatively arrange the truss layout to minimize costs through the avoidance of high concentrated loads, excessive over-framed conditions, or labor-intensive designs. The component manufacturer would not be able to match the designs to their inventory for lumber and plates. In fact, the component manufacturer may be forced to buy plates from suppliers other than the supplier that they normally buy from. The component manufacturer would not be able to match the designs to the equipment capabilities of their shop or delivery equipment.

In my opinion, the truss design engineer and plate companies could also be subject to increased product liability. If the building designer produces poor truss designs, which are manufactured without any involvement on the part of a qualified truss engineer, the trusses may perform poorly. Trusses can be designed on all of the major design software that will exhibit excessive deflection or vibration without any warning from the software. The building designer may also produce designs that will not fit on the building correctly. If a truss does not fit, who would bear the cost of its replacement? If a truss fails, would it be the fault of the building designer, the software provider, the contractor, the component manufacturer or the plate company?

THE SUPPLIER FACTOR

Beyond the liability questions, the connector plate companies would also be likely to experience new or increased competitive forces. Component manufacturers would have little or no reason to use only one plate supplier. In fact, the component manufacturer would be compelled to buy whatever plates might be specified. Great pressure would be placed on the connector plate company to be the low-cost software provider to the building designer. Effectiveness of design would also suffer. The building designer would not compete with other designers solely on the cost of the components like the component manufacturer does. Therefore, it is likely that the designs produced would be less efficient than the design that component manufacturers would have produced. The connector plate suppliers, who also provide software, would also have incentive to “beef up” designs to limit the liability concerns discussed above.

I hope the discussion above sparks your thinking. WTCA and TPI need your input as we work together to monitor and consider our role in the movement toward full building analysis of wood frame buildings.

SBC HOME PAGE

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