## STRUCTURAL BUILDING COMPONENTS MAGAZINE (FORMERLY woodwords) June/July 1999

## **Executive Director's Message**



"Words of Wisdom from Industry Veterans" by Kirk Grundahl

In this issue of *WOODWORDS* we are focusing on the engineering/technology and Codes and Standards work going on in our industry. To that end, I have received two letters from industry veterans—people I consider good friends of our industry—that provide valuable insights we need to take into consideration as we move our industry forward.

These letters were in response to the following concepts stated in our April issue:

Performing total building design is certainly within the realm of reason for our industry to undertake. The software that our industry uses is rapidly moving in that direction anyway. One of the key projects that the WTCA Marketing Committee is currently working on is to rethink the way we design and construct the residential and light commercial structure. We are looking at:

- Performing 3-D structural analyses of a wood frame house/light commercial system.
- Optimizing the wood framing system by fully utilizing component elements for the floors, walls and roofs.
- Looking at wider on-center truss spacing, wall panel components with wider stud spacing and plated joints, roof panel components, and ceiling panel components.
- Developing these component systems in concert with builders to ensure that we speed up construction time and simplify the construction process.

Our goal over the next few years is to gain a far better understanding of building design and allow each of our members to use this understanding to better serve their customer base.

Sherm Nelson, a consulting engineer from Oceanside, Oregon, contributed the following thoughts on the matter:

"Kirk, thank you for another issue of *WOODWORDS*. Your April edition writing was excellent as usual, but it left me with a concern. I realize what you mean by 'optimizing,' that is, to 'fully utilize what is properly available.' However, if I didn't realize that, and if I was not knowledgeable of the technical aspects of 'proper' (i.e., if I were a typical layman or business owner), I might think that you were saying that 'we are way too conservative in the truss industry, being unjustly restrained by regulations and standards.'

"Too often University researchers try to gain acceptance for their projects by creating a product safety concern or, conversely, by professing that there is opportunity to relax standards. I don't see enough opposition to that 'let me be your hero' approach to keep things in balance. We have previously discussed my concern that our great abilities to optimize designs with computers and other automation has surpassed our ability to apply proper judgment. This is particularly true when those left to apply the judgment have only partial or limited experience with the total picture. Their ability is stretched beyond their means to fully consider all parameters of individual applications. Those few who do understand the full concept don't need added pressure from management to relax standards.

"I am reminded of a non-engineer manager of a truss company that told me that HE 'decided to use the plates and services from "XXX company" because (in his opinion) they had the right number and sizes of plates in their designs.'

"You might consider supporting the well-founded basis for standards developments in one of your future articles. After all, who are we really competing with, each other?"

Stanley K. Suddarth, P.E., Ph.D., an engineering consultant and 1986 WTCA Hall of Fame Member from Sherwood, Oregon, has similar thoughts as he looks to the future of our industry:

"Dear Kirk, I was particularly impressed with the April issue of *WOODWORDS* and read everything. The directory was also impressive—WTCA has grown into a large and substantial organization.

"I liked your article on peeking into the future. I do not have any particularly futuristic thoughts beyond the opinion that the future will unfold like the past in actual bits and pieces that reveal great progress in retrospect. I do, however, have some observations from my forty years of experience that might prove useful at one point or another.

"If truss designers must move toward becoming building designers, we must be careful not to become overly impressed with computer power. Our wood structural analytic systems are loaded with assumptions. We know least about mechanical connections; they must be displaced to develop resistance and their behavior is curvilinear. Common sense and experienced judgment are as important as they ever were, maybe more so. I have done some legal work in recent years and have seen some pretty stupid output from structural software applications.

"Recognition of the nature of real loads can be of critical importance. Computer and testing machine loads are passive in that they allow for a pause after a failure is indicated or experienced. Active loads like gravity, on the other hand, chase you all the way to the ground picking up kinetic energy as they go. I built my first hydraulic truss testing apparatus in 1955 because we had been testing roof assembly strength with gravity loads. This was obviously dangerous and invariably resulted in explosive, complete failures with little or no clue as to where they originated. With hydraulics, a failure would cause the load to drop off and we could pause and examine the source of weakness and improve the designs, but we lost the reality of active load behavior. Many times, resumption of loading would reveal that the structure could carry even more load before the next failure. It was tempting to believe that we were seeing

reserve strength, but I finally came to believe that if the load was active, the energy release of the first failure would most likely have precipitated the total collapse that we had observed in the gravity load cases.

"I have seen the same phenomena in computer analysis as in hydraulic testing where a series of failures is found with escalating load levels. This leads some technologists to believe that this is an indication of reserve strength in the structure. I will admit that reserve capacity can well exist but use of the notion in a design of a real structure requires careful proof to be sure that the reserve is not just the result of analytic assumption or lack of realism in the verification tests.

"It is true that a broken floor joist is occasionally found but also true that a real active uniform load rarely, if ever, exists on light construction floors.

"Beware of the individual who has only computer or testing machine proof of redundant strength in a structure."

Thank you, Sherm and Stan, for your provocative thoughts on the future of our industry.

To quickly summarize the key concepts here:

- Be wary of computers, their power to calculate and the purely analytical techniques they use.
- Do not believe everything a computer generates.
- Carefully assess all assumptions that may have been made.
- Develop a good understanding and "feel" for true structural performance so that good judgment can be applied.
- Optimization is an attractive concept but can be misunderstood or misused.
- Consider that the behavior of the structure is far more complex than we have had the ability to accurately analyze today, hence many assumptions have been made.

So, how are we taking these concepts into consideration? First of all, it is true that our industry is developing revolutionary analytical tools that we have never before had, primarily because the computer of today is so powerful. We are also aware that some individuals in our industry believe that if the computer generates successful output with a CSI less than one that any truss will perform fine or, just as bad, that if the "Monte Carlo" computer simulation says performance is okay, it must be okay. This has led those of us involved in this process to be very demanding about understanding true performance. Our desire is to physically and analytically test all our assumptions and results. This is very expensive but necessary. We do not believe that we can move this industry forward without a good sound database of actual performance, primarily because we are rapidly moving outside the bounds of simple linear/elastic performance that we have used for the last 47 years. We are absolutely moving outside of our "comfort zone."

Secondly, as an industry, we have established our Truss Technician Training<sup>™</sup> program. In the context of our future, this program is very important. Our goal here is to assist in providing a "feel" for what is "proper" in the design of structural component systems. Feedback suggests we are succeeding.

Thirdly, we have established our *WTCA QC* program. We cannot advance our industry with more complex analytical tools that result in more critical applications if we do not have assurance that the quality is built in. Then our products are assured to perform at a very consistent and high level.

Finally, we are working with the NAHB Research Center on a Certified Framer Program to aid in the assurance that we have sound installation of these critical structural components.

All of us involved with WTCA have reason to be excited about our future because we have taken so many strides forward. We are poised to provide even greater value through positive change in the future. Can we accomplish all of this? As Bob Ward so eloquently stated in his 1998 WTCA Hall of Fame speech, "We can accomplish anything we set our mind to if we speak the same language and are united in spirit and purpose (paraphrased)." We will accomplish much because WTCA's membership is made up of tremendous people with incredible talent who focus on our most valuable asset—our united spirit.

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