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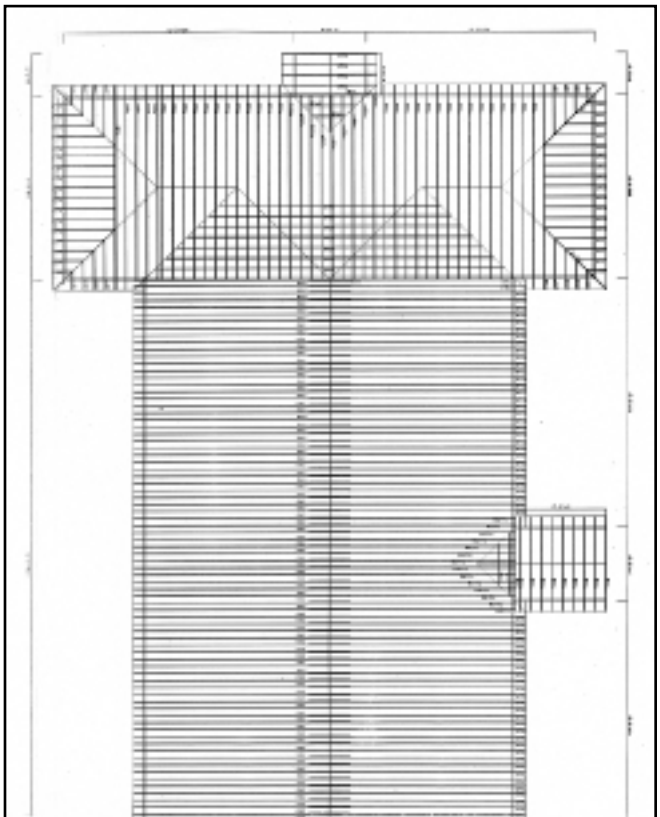
"Scissors Trusses" by Bruce C. Hutchins

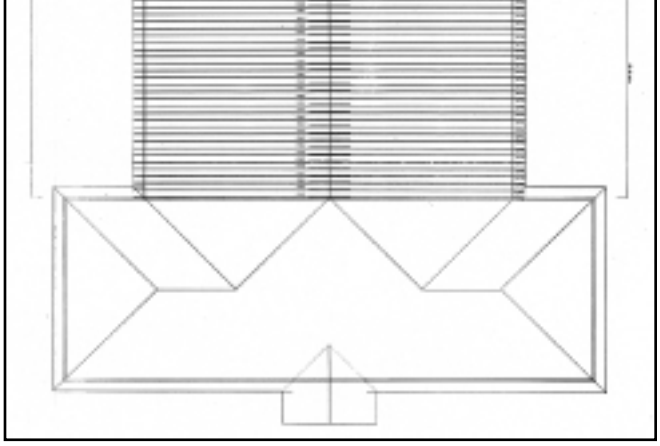
As with most projects, things begin innocently enough. The prospect of a large sale will oftentimes induce a truss technician and his company to assume many roles, which at times extend beyond a correct responsibility. How many times have you heard (and had to deny), the statement: “Hey, you guys are the engineers.” I’m sure many readers can relate to this quite well. Let me give you an example of what my company faced during our summer rush period.

We received a call from one of our road salesmen inquiring about a few simple truss shapes for budgetary purposes. The project was unspecified except for the location. He asked for prices on a 35'-0", 4/12 in both regulars and matching gables. A few days later, a third shape was requested: 70'-0" with a pitch that would avoid extreme cap and base heights. (We have 12' final presses.) A shape consisting of a cap and base at 4/12 was settled on and bid.

A few days later the customer called us directly and asked whether a scissors truss at the large span could be designed. The designer handling the job warned of various characteristics inherent in scissors trusses in general and long spans in particular. These included lateral thrust at bearings, excessive deflection and problems relating to erection of such a large span configuration. The designer quoted verbatim from HIB-91. The customer pressed for a price and requested an engineering drawing.

The scissors was made up of 2x6 top and bottom chords spaced at 16" o.c. It also was of a cap and base configuration. We immediately asked our outside truss design engineer to prepare sealed truss design drawings. These drawings were then faxed and mailed to the contractor.





A couple of weeks later we received a two-page plan, both with the same page number on them, one depicting the foundation and the other the floor plan. The foundation plan was marked “preliminary.” The title block contained an architect’s name and typical information. There were no elevations and sections were limited to two foundation details. A note with the stipulated desired delivery dates was attached to the plan. This date was approximately two to three weeks in the future. The building was in a basic “H” shape consisting of two 35'-0" wings separated by the 70'-0" main hall. The structure was to be a dining hall for a summer camp. Additionally, the short wings now had hip ends with valley sets planing out from the big scissor. The salesman called me and said that the delivery date was critical. Additionally, he stated that there were several companies vying for the project and the related sales (lumber, plywood , shingles, etc.) were substantial.

As the original truss technician was now on vacation, I prepared a revised quote myself. Within a day or two of presenting the quote it was accepted, with the stipulation that trusses (at least the first delivery) be on the job by the first of the next month, which was approximately 14 days away. As I was currently involved in several multi-family projects, I worked the deadline backwards and reasoned that I had a couple of days before a submittal needed to be sent out. However, the customer (and the salesman) grew impatient within a day and began exerting pressure through various channels. Upon a call from upper management, I promised and delivered a submittal in time to be overnighted that day.

The next day, one of the contractor’s employees called wanting to discuss how to continue sheetrock of a firewall up through the valley set at the junction between the large wing and the side wings. I was questioned as to the ratings of various assemblies and how to accommodate them. I referred the contractor to the building designer for this information. I also questioned the contractor as to the completeness of the drawings as submitted and his response was “that’s all there is.” He also noted that the scissors had been drawn at 24" o.c. spacing on the layout. I confirmed that the scissors did indeed need to be placed at 16" o.c. and that I would revise the layout to show this. This was evidently a leftover from the previous flat bottom chord design that was at 24" o.c. Additionally, I cautioned them about handling, erection and the extreme lateral thrust inherent in scissors, and the need to consult with the building designer.

Subsequently, we received a signed approval of the shop drawings and proceeded with fabrication. The contractor indicated that he wanted delivery of the smaller spans first. The day after the delivery I received a call from the supervisor on the job saying that 35'-0" common trusses did not match the step-downs. This was because I had kept the common truss as is from the original bid and missed the 2x4-heel height it possessed during the final check. I had raised

the heels of all others to match the heel of the large span scissors. This was remedied by providing material to pack up the planes. Additionally, we acknowledged acceptance of a forthcoming back-charge for labor to install this material.

Within a few days, deliveries were complete and the turbulence caused by the heel height difference had subsided. I then received inquiry from the field via our salesman asking if the large scissors had a lower pitch than the 35' trusses. Further investigation revealed that upon setting the first large scissors an appreciable deflection had caused the contractor to believe that the truss had been made at a lower pitch. Additionally, this condition rendered the valley set useless as it was sitting on the 35' span which exhibited no deflection.

Needless to say, I visited the site the next morning. It was a very hostile meeting with all parties looking to me as both the cause and remedy of the problem. The contractor felt that if it was evident that the scissors was going to deflect, then the other spans should have had comparable deflection designed into them. They also questioned me as to sequence and methods of bracing. They became frustrated with my repeated suggestion that they consult the building designer.

The next day I was copied on a letter from the contractor's office detailing events as they had occurred and reactions to the previous days meeting. Addition-ally, it went on to attack me personally for designing a "failed system." Their stance was that we were to review our own drawings and decide if the components would perform up to their expectations as a system. The author had also called a few of our competitors and gathered any skepticism voiced by them. In discussions with our salesman, I learned that this project was a design/build and that the author of the letter—a non-engineer—had prepared the drawings. What's more, the submittal was reviewed and approved by him only. Typically, our drawings are first reviewed by the contractor and then passed on to the building designer, who is either the project engineer and/or architect.

In my response to this letter, I felt it imperative that I make clear the extent of our responsibility as the truss manufacturer. I informed them that the extent of our assistance would be limited to engineered repairs should any components become damaged during handling or erection. I also stated that we would not be an assumed member of their building design team. I enclosed WTCA's "Design Responsibilities" document, HIB-91, and some bracing information downloaded from "TrussNet" and the WTCA web site. The contractor contacted upper management and asked for continued assistance and dangled the carrot of larger future projects. Wisely we continued our previous stance and referred them to an engineer or architect.

Within a week we started receiving calls from an independent professional engineer who wanted to discuss the engineering drawings in general terms. I inquired whether he was in fact the engineer of record for the project. He professed minimal involvement in that he designed the septic system and some of the footings. We discussed several items on the drawings and he asked me to print out a long report of the same and send it to him.

A few days later I received a call from an associate in the engineer's office professing confusion relative to the computer-generated output she was reviewing. I put her in touch with our truss designer. A few days later I heard that the engineer's office had not only spoken with the truss designer but had called the corporate office of the truss designer and other truss manufacturers

in the area soliciting opinions.

In the end, after reviewing pinned/pinned reactions and the related deflections that were shown to occur, the engineer (now an after-the-fact building designer) decided to install a set of columns and beams to provide bearing under the bottom chord peak. This was the final resolution.

LESSONS LEARNED

- Be very wary of incomplete plans and specifications, contractor project control and no review and approvals from a registered building designer. Good project planning eliminates downstream mistakes and problems.
- Make sure your salespeople and truss technicians communicate closely and support each other. One resource to teach your salespeople basic technical information is WTCA's Truss Technician Training for Salespeople course.
- Watch out for rush jobs as they generally lead to back-charges.
- Red flag instances where pressure is placed on employees and the project by the customer calling company senior management and making project demands. These situations cause potential problems downstream and often result in back-charges.
- Enclose WTCA's "Design Responsibilities" document with every approval submittal and have a disclaimer letter that contractors are required to sign for any project that involves long span scissors.
- Utilize WTCA's valuable information resources. They have prepared information and procedures designed to protect the assets of all of our businesses. It is important to learn about and use all tools that are provided.

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