

STRUCTURAL BUILDING COMPONENTS MAGAZINE

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Q & A: Specialty Structural Engineers [Reprinted with permission from the September 2003 issue of STRUCTURE Magazine (Volume 10, Number 7)].

Design responsibilities was a hot topic in the May 2003 issue of STRUCTURE, prompting a response tailored to the specific concerns of the plated wood truss industry.

The following letter was written in response to the May 2003 issue of Structure Magazine, in which the column Structural Forum discussed "The Role and Responsibilities of 'Specialty' Engineers." The email forum was prompted, in part, in response to the West Warwick, RI, nightclub fire in which 100 people died and nearly 200 were injured. The following questions were posed in Structural Forum and compelled the response of Kirk Grundahl, P.E. and Dave Brakeman, P.E., S.E. (For full text of the forum, visit <http://www.structuremag.org/archives.htm>.)

Q: Who is responsible for designing temporary and permanent bracing of plated wood trusses?

A: If the Engineered Product is an independent structural assembly of plated wood trusses imposed upon the total structural system, all permanent bracing must be part of the Specialty Structural Engineer's responsibility. When the Engineered Product is a component or assembly with the structural system, the SSE is the only person in a position to determine temporary bracing requirements, and is the only one who knows the basis for the parameters for which each member was designed. Thus, it is recommended that the required temporary and permanent bracing also be included in the sealed set of shop drawings received from the SSE. Who actually supplies the bracing material is between the GC and the supplier of the Engineered Product.

The SER [or DR] should be responsible for locating and sizing the lateral bracing to be used to transfer wall and diaphragm forces through the trusses into shear walls or braced frames. Additionally, the SER [or DR] should supply special loading criteria to the SSE for things such as chord forces, drag strut forces and collector forces that is expected to be used in the design of the Engineered Products.

Q: In general, who is responsible for adequacy of temporary bracing of structural framing during construction?

A: Notwithstanding recent publications by ASCE and AISC on stability of structures during construction, OSHA makes it very clear in the recent revision of the standard for safety of structural steel, steel joist and metal building system

erection that the Erector is responsible for maintaining stability of the framing at all times during its construction. Generally, the SER is not involved in designing temporary bracing of steel framing. But AISC notes exceptions in its 2000 Code of Standard Practice when the SER must provide certain information to the erector so that the framing can be erected safely.

For plated wood trusses and cold-formed light gauge steel trusses, it would seem that bracing these components should be designed by the manufacturer's Specialty Structural Engineer, and installation thereof should be done by the competent persons employed by the on-site erector.

TO STRUCTURAL FORUM:

The comments in Structure Magazine's May 2003 Structural Forum on Specialty Structural Engineers were of keen interest to the plated wood truss industry in particular, and the structural building components industry in general. Our industry welcomes a healthy interchange of ideas where the viewpoints of all structural engineers and suppliers of engineered building products can be more thoroughly understood. This can only lead to structures that are more safe, reliable and economical.

In a nutshell, what the contributors to the forum seem to be saying is that:

1. All temporary bracing and all permanent bracing design should be part of the sealed shop drawings, or what we call truss design drawings.
2. The supply of bracing material for the project can be either the responsibility of the General Contractor (GC) or the supplier of the engineered components.

The structural building components industry does provide guidelines for the installation of temporary and permanent bracing. These documents, if followed by the installation contractor, should eliminate most of the problems referenced in this forum. Additionally, the structural building components industry operates under the expectation that the installation contractor or GC is a professional, and that he/she is competent to undertake the work they have agreed to do on any given project. There is really no good way for the truss manufacturer to know if the GC has the requisite expertise to undertake all the construction nuances of the project that has been awarded to them, particularly the nuances and importance of structural framing. If the contractor believes they need assistance in some aspect of the construction project, then it is their responsibility to find the help they need from a competent party. Given this, it is agreed within our industry that the typical scope of work of the contractor is as follows:

4.0 CONTRACTOR RESPONSIBILITIES

4.1 Provide to the Truss Manufacturer the Construction Design Documents and all revisions and supplements thereto.

4.2 Review and approve the Truss Placement Plan and each Truss Design Drawing for

conformance with the requirements and intent of the Construction Design Documents, and the effect of the Truss Placement Plan and each Truss Design Drawing on other trades involved in the construction of the structure and the effect of the other trades on the Trusses.

4.3 Coordinate the review, approval and return of each Truss Design Drawing and the Truss Placement Plan by the Owner and Building Designer.

4.4 Provide the approved Truss Design Drawings, approved Truss Placement Plans, and any supplemental information provided by the Truss Manufacturer to the individual or organization responsible for the installation of the Trusses.

4.5 Comply with the field storage, handling, installation, permanent bracing, anchorage, connections and field assembly requirements of the Construction Design Documents.

4.6 Determine and install the temporary bracing for the structure, including the Trusses.

(Wood Truss Council of America, Standard Responsibilities in the Design Process Involving Metal Plate Connected Wood Trusses, WTCA 1-1995, §§ 4.1 - 4.6)

We believe that, beyond the GC needing to implement the temporary and permanent bracing in the actual structure, the ideal person to develop and design both the temporary and permanent bracing plan is the Structural Engineer of Record (SER). The SER is the construction professional that is most intimately familiar with the flow of loads through the entire building and is the one who can use this knowledge to ensure bracing success. The logical design-build process that would maximize design accuracy and minimize mistakes follows:

1. Owner hires a design team to undertake the architectural and structural design.
2. The structural design team decides to use structural building components and gets the structural building components supplier involved in the project design process.
3. From there, the roof trusses are designed per the loading requirements provided by the SER.
4. The finished roof truss design is provided back to the SER who takes this information and designs the transfer of loads to the walls and floor below. It is at this time that the permanent bracing design is completed.
5. The process continues until all loads are properly transferred to the foundation.
6. The contractor then takes the complete set of plans and implements the design that includes every detail needed to make the construction project successful.
7. Finally, a building official performs an inspection to ensure that all involved in the design build project have not missed a detail that needed to be installed.

Why does this ideal process break down? Generally, it is due to money. Everyone in the process wants to do the job as cheaply as possible; therefore, the architect or owner bypasses the SER and just hires a GC. The GC gets bids from a variety of component suppliers of varying expertise and takes the lowest bid. The structural building components manufacturer is given a set of plans that, in our experience, are highly variable in the amount of detail provided and completeness of specifications. We are asked to make them work structurally, to carry all the loads applied to the structure, and if the loads are not defined, to define them, and then make sure that the building as designed meets the expectations of everyone involved in the project; and we usually do.

The standard contract that the structural building components manufacturer makes is only for the design of the individual components; it is not for determining the loads, the design of the temporary or permanent bracing, the design of connections, or the design of load transfer to diaphragms and shearwalls, etc. Often, however, the structural building components manufacturer is asked to solve the problems that the GC is having; and being an industry that is service- oriented, the structural building components manufacturer usually figures out a way to help.

From the vantage point of the structural building components manufacturer and specialty structural engineer, we are faced with the following situation:

1. The structural building components industry has always focused its efforts on what it does well and that is to design and manufacture structural building components.
2. Plans and specifications are often found to have severe shortcomings, and in some cases what is provided to our industry as the structural design simply does not work structurally.
3. We find ourselves increasingly being pushed to become the "Building Designer" for the projects that we are working on, because the work by the design professional community is incomplete.
4. We also find ourselves increasingly being pushed to become the "Installation Professional" for the projects that we are working on, because the installation work by the contracting community is inadequate.

So what does all this mean to the structural building components manufacturer and specialty structural engineer? Do we need to consider adding building design and installation to our business repertoire and be paid for the work we are increasingly being asked to do? Ideally, everyone in the building design and construction professions should be able to figure out a better way of collaborating, so that everyone that has a job to do in the process is able to do that job, be treated fairly in the process and get paid for the work that they are responsible for.

Ultimately the market place is efficient, and the solution to the problems that are surfacing will be determined there. We can all go it alone and make business adjustments to meet market needs ourselves. Or, we can think deeply about these issues and figure out ways to build on the expertise of the individual entities involved in the construction process and collaborate. Given

the speed of change today, the direction this will take may be quicker than any of us expect. The real question is what will be the ramifications of the outcome to each of our businesses, and do we want to be part of the solution(s) or part of the problem? Our industry has always been in the solutions business, and we will work with anyone and any group to ensure that we all have bright futures in this chosen profession.

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