

Shop Drawing SNAFU

I am writing regarding Session D2, "Should Engineers Directly Hire Detailers?" slated for the 2004 NASCC.

A number of years ago, a public building project was bid in Portland, OR and went to one of the city's major contractors. This contractor accepted a steel fabrication bid from a fabricator not well experienced at this level of construction. He, in turn, hired a draftsman not well experienced at structural steel detailing. The draftsman knew little of AISC's *Detailing for Steel Construction* publication.

This combination of scenarios led to the production of poor shop drawings. The general contractor sub-contracted to a steel erector who was kept out of the loop on the shop-drawing review procedure. Neither the general contractor, architect or structural engineer raised any concern about the deficient shop drawings. There was no indication on the shop drawings that anyone performed a serious review, and this resulted in numerous fabrication errors. The erector, to his detriment, attempted to fix some of the errors in the field, but many of the pieces were returned to the fabricator.

At this point, in my opinion, the erector should have pulled off of the job. But he was persuaded to continue working to get the building put together, and his cost overruns were enormous. The erector made claims for the cost overruns, which the general contractor rejected and counter-claimed for delay of project. The case ended up with the American Arbitration Association. The three men (all general contractors) selected to arbitrate the case supported the general contractor despite the overwhelming evidence in favor of the erector. The erector was ruined. His business and all of his life savings were lost.

What went wrong? Nobody adequately checked the shop drawings.

The erector that is subject of this letter approached me, a structural engineer, to review what had gone wrong and to provide testimony for his case. I offered him some suggestions on avoiding a repeat of this case. One was to be in the loop of shop drawing review with the right of rejection if drawings are not up to industry practice or have not been thoroughly checked.

There are probably a number of ways to solve the problem, and all require meeting AISC detailing standards. Start by including the detailing within the contract of the structural engineer as suggested in the title of your panel. Another is to require more thorough shop drawing reviews by structural engineers for detailing errors. Most do not review drawings for specific detailing errors since they are not trained in the skills, or *art* of detailing, or they don't have the money in their contract to do it right.

There are also problems that arise from the different detailing practices common to different fabricators, which hinder the engineer's ability to learn these skills, but the engineer could at least check for work points on each and every detailed steel member.

The other solution is to raise the standards for steel detailing by act of law. Why not institute a professional detailer license as is done with architects and engineers? Why not a mandatory standard for detailing steel structures published by AISC? We design to AISC specifications and should detail to AISC specifications as well. The AISC detailing handbook might require re-writing to be a legal standard rather than just a guide.

Structures have reached such a level of sophistication that most are detailed by skilled technicians. However a lot of contractors still look for ways to be more competitive by using insufficiently skilled subcontractors. Likewise, architects and engineers don't feel they get enough money to do adequate checking—so most don't. This is why I believe accountability in detailing must be tightened.

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One-Third Increase

With reference to the article by Keith Mueller and Charles Carter on the subject of the one-third stress increase (*Modern Steel Construction*, October 2003), please note that some of us disagree with this change after perhaps 100 years of use. The basis for the increase has always been that wind is a transient load that could occur one or several times during the life of the structure, and that premise has not changed.

I can think of no rational criteria to require a second transient load (snow will never remain on a roof during a hurricane except perhaps in Alaska). In addition, not applying the reduction to dead load is unconservative in light-weight structures in hurricane zones where the dead load reduces the wind uplift (this should at least be addressed in the codes); those of us that design such structures divert from the code to be more conservative.

No competent engineer would combine load reduction with the one-third increase, so that, of course, should be a requirement. However, I look forward to an explanation as to why the one-third increase has been eliminated from ASCE 7 and subsequently from the AISC and aluminum design manuals.

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Author's Comments:

The authors appreciate the inquiry and agree that an explanation regarding the removal of the one-third stress increase would be beneficial. AISC is not in a position to provide such an explanation because it is a matter governed by the load standard SEI/ASCE 7, which is the responsibility of SEI/ASCE. We will, however, forward your question to the SEI/ASCE 7 committee and seek an explanation for you.

Zakim Bunker Hill Bridge

Congratulations to all that contributed to the glamorous new Boston landmark over the Charles River. Just to complete your credits for the project, the construction engineering for the cable-stayed spans of this unique bridge was performed by TY Lin International in Olympia, WA. The engineering software for construction engineering was TYLI's proprietary PCSEG3D.

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Do you have an opinion?

Modern Steel Construction would like to hear from you! Please send your comments to Scott Melnick, melnick@aisc.org.