

BE CAREFUL: YOU MAY GET WHAT YOU ASKED FOR



I'm a structural engineer and you're a Fabricator— Do you want to fight?



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IDON'T KNOW OF A SINGLE ENGINEER THAT HAS KNOWINGLY PICKED A FIGHT WITH A STEEL FABRICATOR. But there are some steel fabricators that think they do, all the time. How do you think that happens?

The most common way for this to happen is for the structural engineer's drawings to be incomplete or misleading.

When the fabricator gets those types of drawings and has to bid on them, he is forced to complete the incomplete and fill in the misleading information. If he does neither of the two, he runs the risk of distorting his bid and losing the project. If he gets the job, he may run into surprises while preparing the shop drawings or in fabrication. Usually the surprises mean a loss of money and time, which are two scarce commodities. It's a good way to pick a fight.

Let's look at one example of how an engineer can cause this.

Many multi-story steel structures use braced frames to resist lateral forces from wind or seismic loading. It is common to provide a line diagram elevation of the braced frames on the structural drawings. (See Figure 1.0) The diagonal member sizes will be given and sufficient dimensions to define the centerline locations of the members involved. Subject to the practice of the individual firm or engineer, the rest of the information may or may not be given.

Axial loads are often shown, since the fabricator has no way of determining the loads and usually the engineering drafter will provide typical details for

the beam/column/diagonal connections. (See Figure 2.0) Those typical details and the frame elevations commonly require that the centerlines of all members intersect at a common point.

So, when does the fight start?

If the typical details do not closely represent the actual conditions, as they will be built, then there are problems. You looked at an elevation and typical detail. Now, look at the actual condition. (See Figure 2.1) You can see that the connection is significantly different in the actual case than in the typical detail. The actual connection may be impractical to construct or much more elaborate than implied by the typical detail. Either way, the fabricator is facing a situation different than assumed during the bidding and negotiation phase. He either takes the loss or the fight begins.

So, what is the question?

"Mr. Engineer! Are you asking for a fight?"

"No. Read the drawings. There is enough information there."

"Look, I gave you all the dimensions, showed you how all the centerlines are supposed to intersect and gave you how the connection was supposed to be designed. Did you want me to detail all the connections for you?"

Or...

"Sorry, I really didn't mean it."

"We don't have enough time or fee to fully detail all the connections. The

architect is changing things at the last minute and we're up against a deadline. The best we can do is to give you our information and let your detailer figure out the rest. There was enough information there to do that."

**Get an attitude:
the right attitude**

What is the answer?

When I interview an engineer or drafter for a position in my firm, I can learn a great deal about them by looking at their calculations or drafting. They show whether the person is sloppy or neat; organized or disorganized; conservative or liberal and whether their thoughts are logical or not. One of the more important things that drawings can show is how effectively the drafter can communicate and what they think about their audience. Their attitude is the result.

A structural drafter must put himself in the shoes of the steel detailer, fabricator and erector, if he is going to produce a non-combative set of drawings. This means that the drawings should show, simply and succinctly, the necessary information, in a way that will be easy to read and unambiguous. It does not mean that he has to draw architectural or mechanical information, detail every square inch of the structure or assume that his audience has never seen a set of structural drawings before. If the drawings are done well, they will reflect a respect for fabricator and his people.

This attitude is learned. No one inherits a respect for fabricators. If the Principal in an engineering firm does not have an attitude of respect for the fabricator, it is likely that his staff will reflect that same attitude. The responsibility for this attitude lies first with the Principal and then with the engineers and

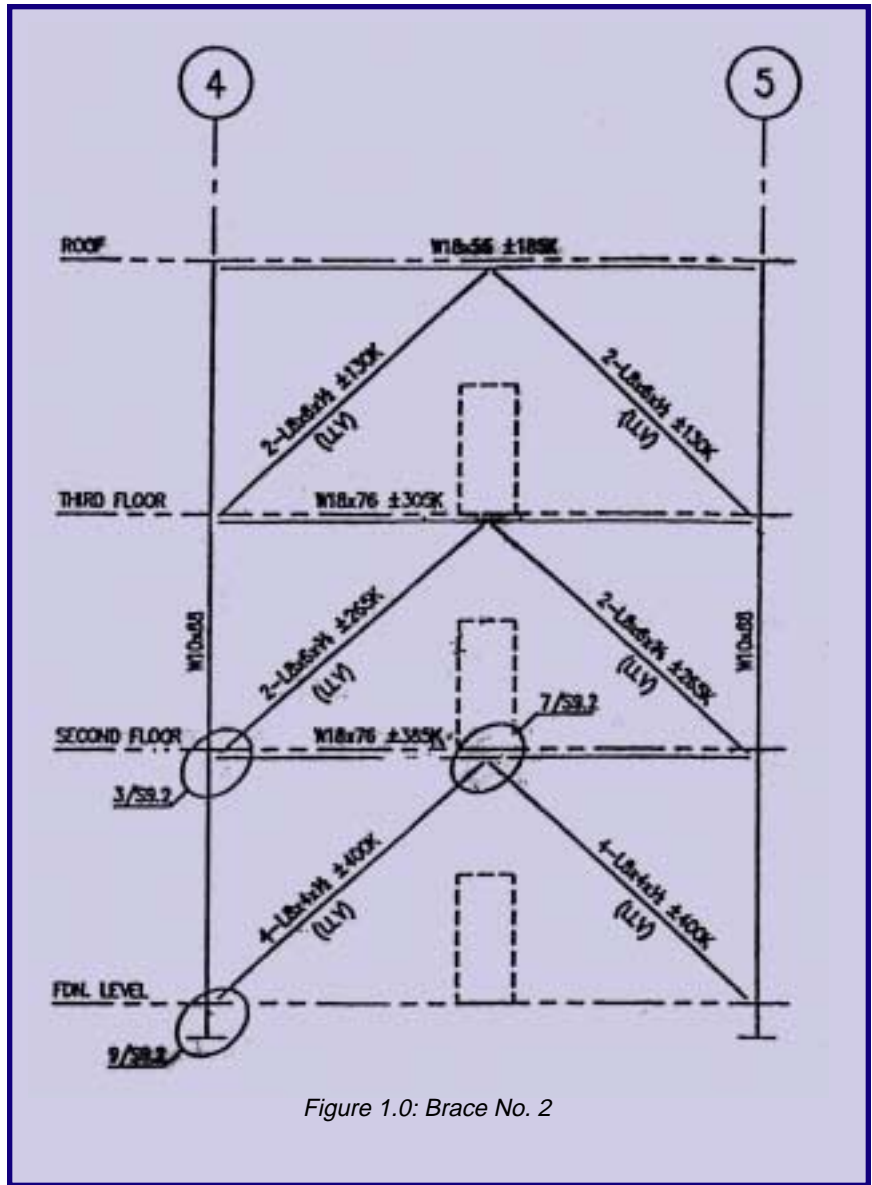


Figure 1.0: Brace No. 2

drafters. If that respect is not present, the suggestions for changing the drawings that are listed below, are not going to be effective. So, as we proceed, we will assume that the engineer respects and wants to communicate effectively with the steel fabricator.

Practice "Anti-crastination"

Here are some techniques you can use to improve your draw-

ings and avoid a fight:

"Anti-crastination" is the opposite of procrastination. I had to make up this word because there is no word in the English language that means the same thing. The idea is to do as many things early as you can do.

I had a prize-winning drafter that was putting out poor quality drawings. I talked to him, and to other staff members, and learned that the drafter did not have enough time to do a decent job. The engineers were not giving him the information that he needed early enough. Of course, I also found out that the architects were not giving the engineers information early enough.

As a result, we began to actively seek information on a project. Not just by asking for it but by probing and questioning the client about his thoughts and offering to help him to arrive at decisions.

We also began to plan more effectively, allowing adequate time for the drafter to do his work. When we had a plan, we could also tell the client when we had to have information in order to meet his deadline.

By practicing anti-crastination, you find that your work atmosphere becomes calm. The pressures of deadlines are diminished because you are ahead of the time curve and you are always exceeding your clients expectations. Needless to say, your end product, the contract documents, are of better quality and will more likely avoid conflicts.

One of the best ways to practice anticrastination is to have a “Right Foot Meeting” with the engineers and drafters at the beginning of the project. A “Right Foot Meeting” is simply a meeting that gets the project off on the right foot. Here is the way we do it.

We have created an agenda that has a standard set of questions to ask and answer about the project. The first questions cover the basic facts of the project, which you would cover in any circumstance. That takes about 7 minutes. The rest of the questions have to do with issues like:

- “What do we need to accomplish during this phase of the project?”
- “What resources do we have to do the project?”
- “How can we exceed our clients expectations?”
- “How can we be more efficient in producing the project?” and
- “How we can avoid mistakes and problems?”

These open-ended questions give the Principal, who is directing the meeting, the flexibility to address many different issues, adjusting for the experience of

the team members and their work habits. It is an opportunity to convey the attitude that we mentioned before and to give specific help in how to produce a set of drawing which are “fabricator friendly”.

Create “Wisdom Drawings & Files”

For our purposes, “wisdom” is defined as, information that you will need to know, in order to perform a task, but will forget in 6 months, if you do not do the task during that time. My staff documents “wisdom” and stores it in the computer network. We have a common computer directory, “MAPS”, (Make A Place for Stuff) that everyone uses to store files related to the firm. Within MAPS, are “Wisdom Files” that contain wisdom on all kinds of subjects. These files can be narratives, design aids or drawings.

With all of your experience and the experience of your staff, you can create “wisdom drawings” that show other staff members effective ways to draw steel framing plans and details. You can have a framing plan that shows your firm’s standard title blocks, titles, notes, grid numbering, section symbols, line weights, dimensional conventions, material textures, etc. You probably have already done this in some form or other. Take it to another level by showing information that is more sophisticated or use it as a base line for having your staff suggest improvements to how the drawings are done. You can make notations that remind the drafter to check to make sure that the “typical detail” accurately represents the condition on this project.

Encourage “Pit Stops”

“Right Foot Meetings” are good preventive measures to take at the beginning of a project or each phase of a project. “Wisdom Drawings or Files” are also preventative, in that they are a resource to look at before you begin a task. However, if things start to go wrong in the process of producing the work, try another technique, called “Pit Stops”. “Pit Stops” are used to make repairs while the race is underway. If you bust an oil line, lose third gear, crumple the sheet metal or blow your engine, you have to get back to the pits or you are out of the race.

The pit stop, in the engineering office, is the act of getting help when something isn’t working correctly. Each staff member should have at least one person to go to for help. Once that happens, it often is not difficult to correct the problem. More times than not, the difficulty is in not asking for help. So, I have tried to come up with a list of conditions that will be signals for any engineer or drafter to ask for help. Here they are some examples:

- This task is taking much longer than I expected.
- I am having trouble communicating with the client.
- This drawing does not look right, but I don’t know why.
- I have never done this before and am not sure what I am doing.
- This is going to cost the owner a lot of money.
- I am not sure this is what they asked me to do.
- I can’t get the information that I need.

As you can see, the list could go on much longer and could include many other types of questions. Experiment with your own list but do not let it get longer than 11 conditions. The important thing is not to list

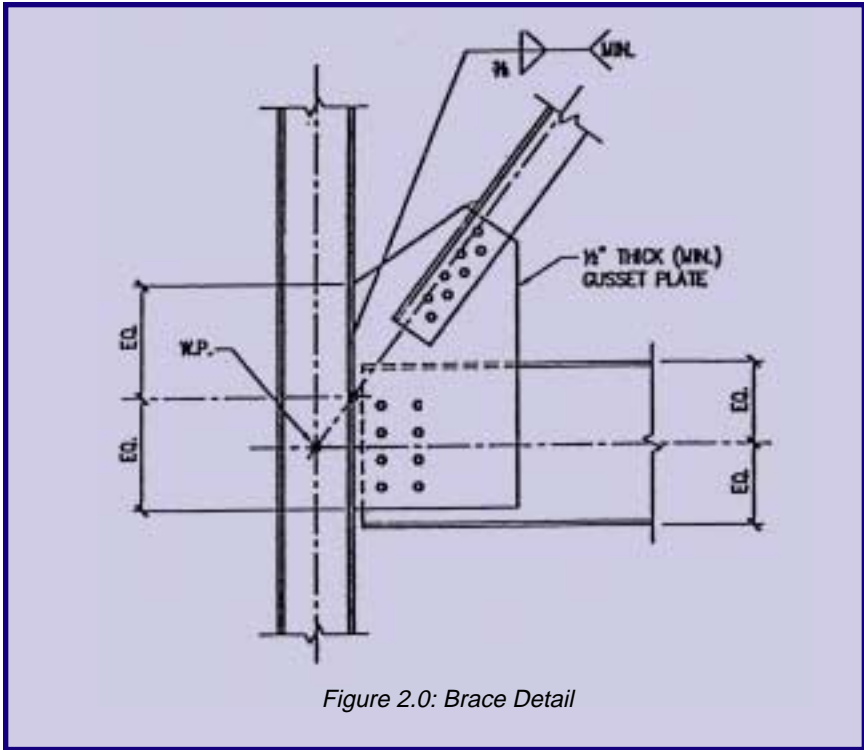


Figure 2.0: Brace Detail

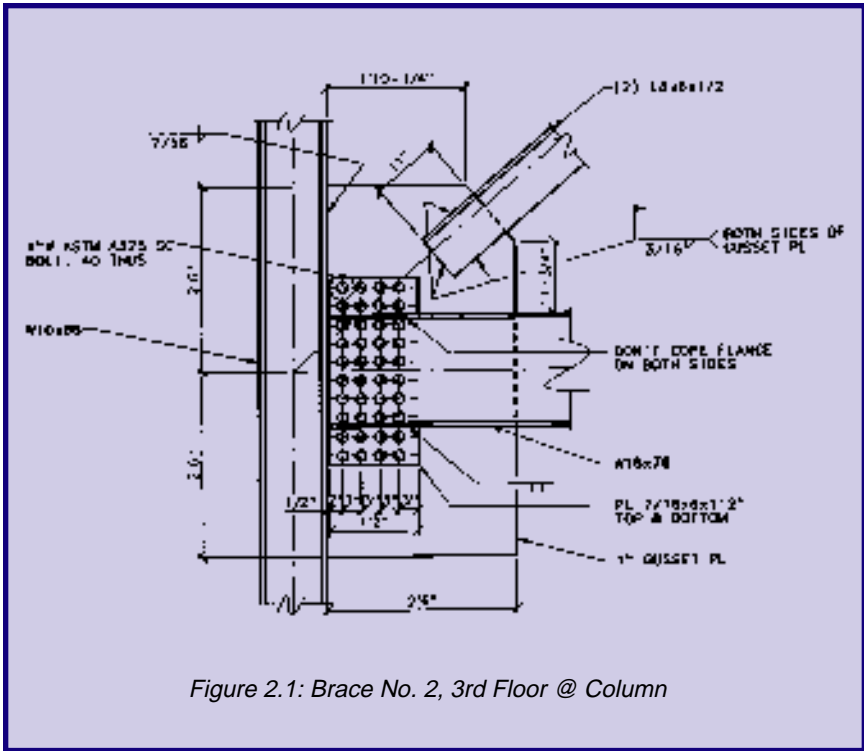


Figure 2.1: Brace No. 2, 3rd Floor @ Column

every possible condition but to let your staff know that you expect them to get help. They should not let a bad situation continue without attempting to correct it. You are on their side and want them to succeed. Let them know that.

Conclusion: Would You Rather Fight Or Switch

I don't know of a single engineer that has knowingly picked a fight with a steel fabricator nor do I know one that wants to pick a fight. It is probably easier than you think to avoid that conflict. The engineer must first have a respectful attitude toward the fabricator. Then he needs to build in procedures that will encourage "Anticrastination" and plan the course of the project by having "Right Foot Meetings" that include discussions that promote better drafting communication. With "Wisdom Drawings or Files", he can reinforce "Fabricator Friendly" drawings and finally keep the project on track with "Pit Stops" to make those repairs that are required along the way. Try these practices. You will avoid conflicts and produce a better project.

This paper is part of the 1999 North American Steel Construction Conference session: "Conflict Avoidance in Fabrication of Structural Steel."